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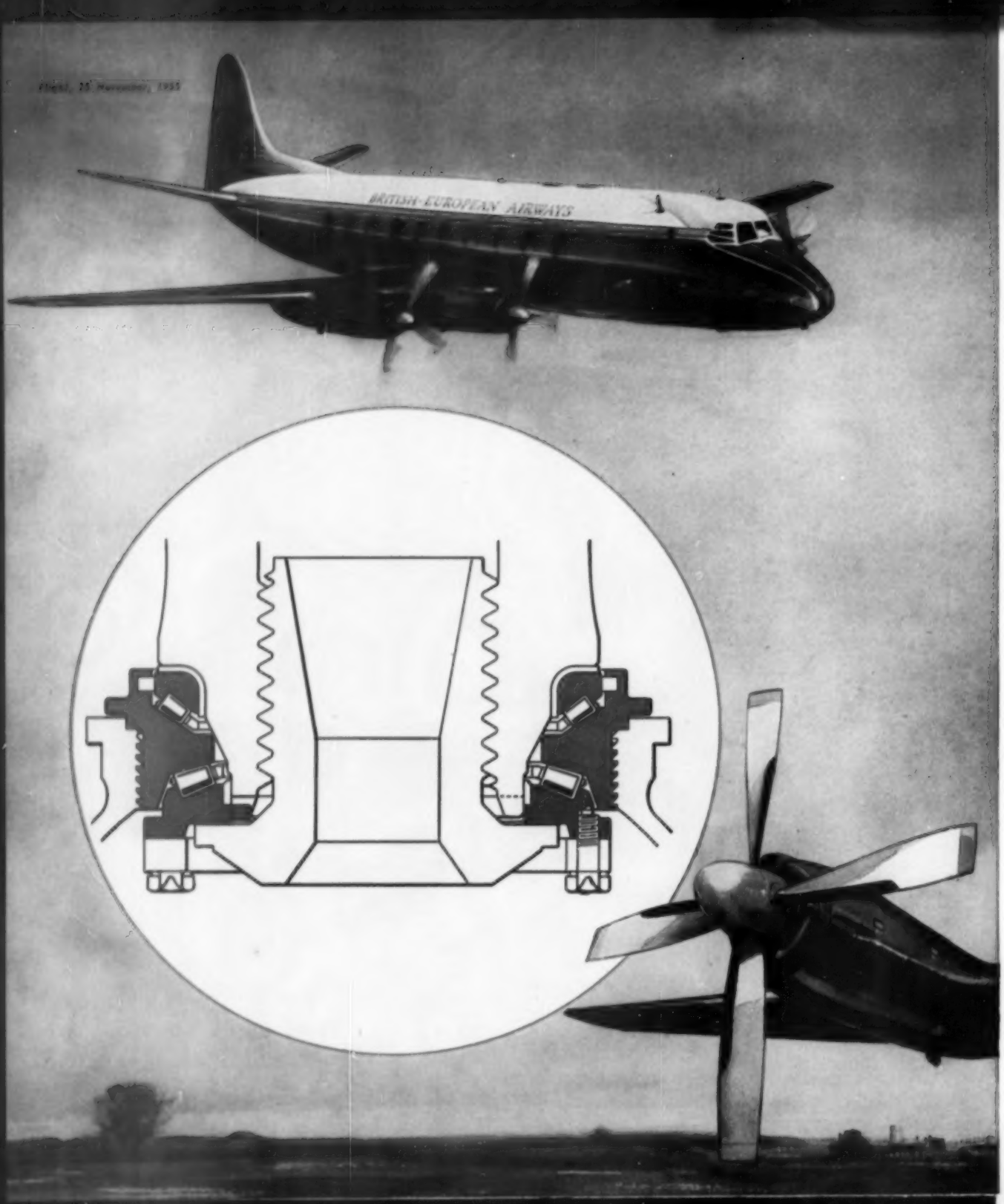

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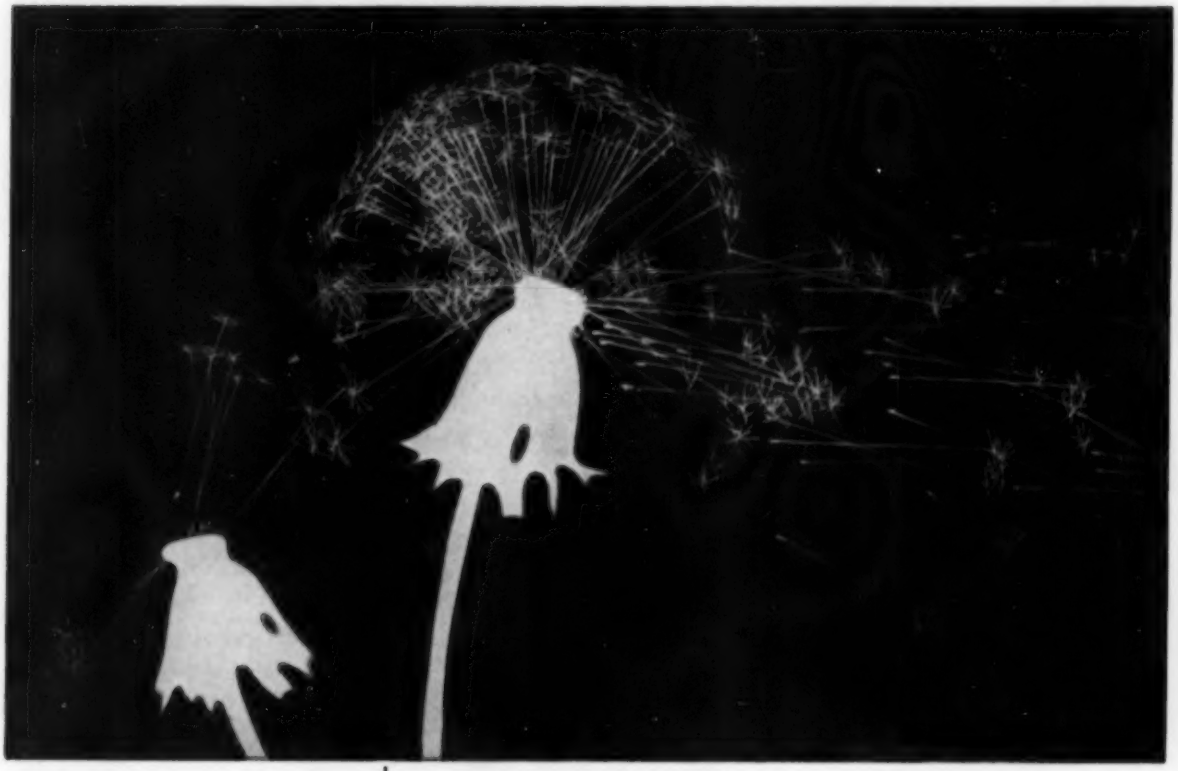

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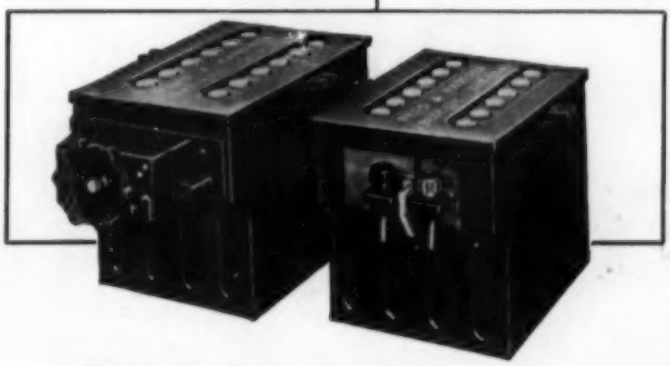

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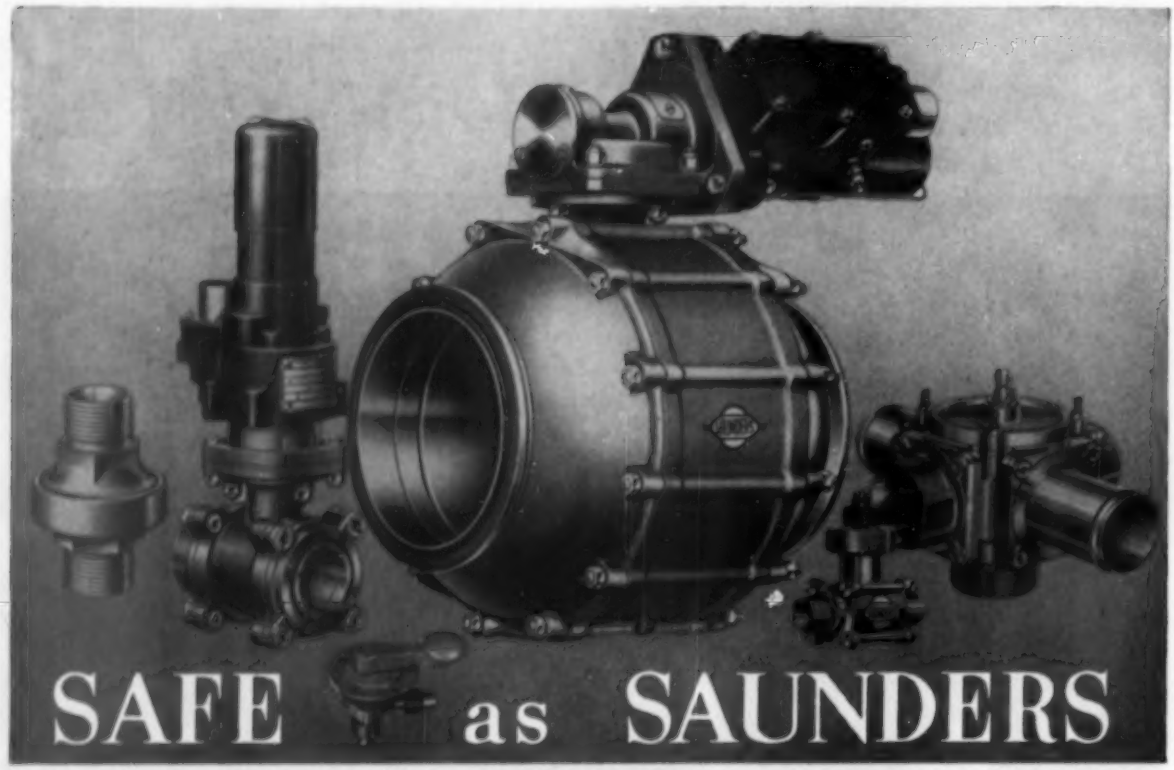

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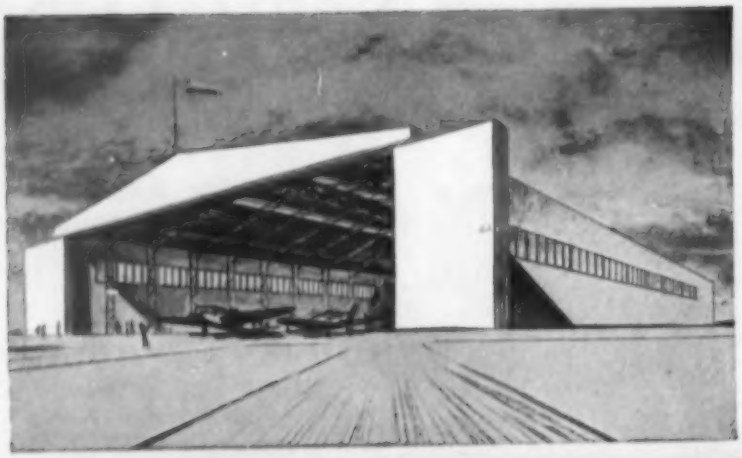

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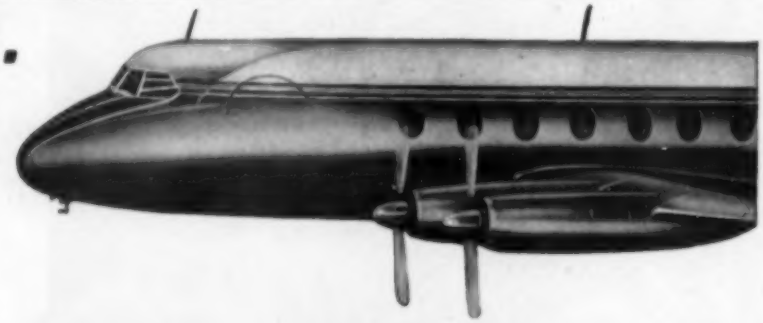

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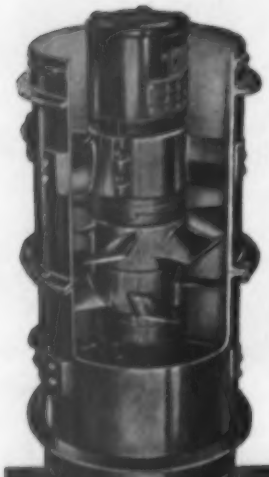

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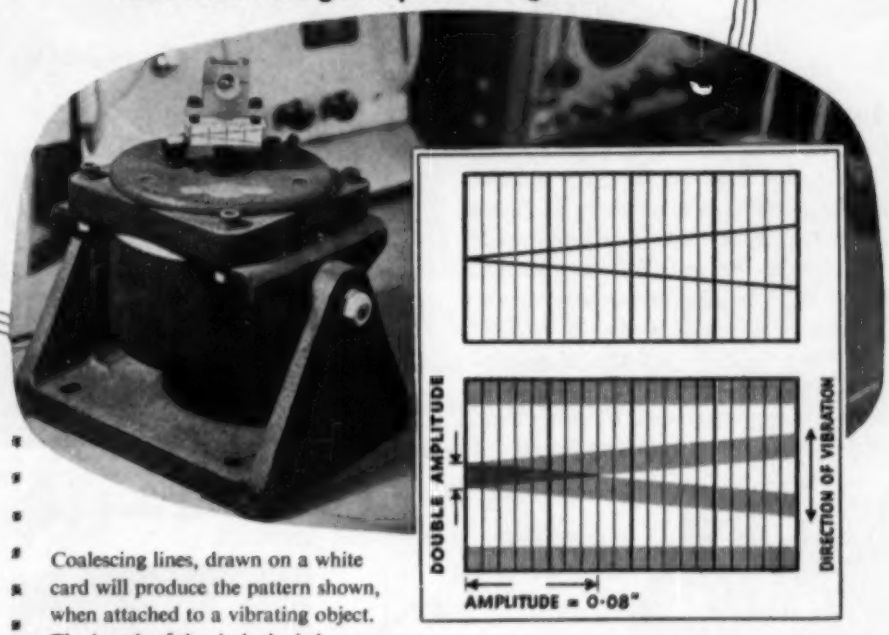

Coalescing lines, drawn on a white card will produce the pattern shown, when attached to a vibrating object. The length of the dark shaded triangle is then a measure of the amplitude. In the original triangle, the ratio of the height to half the base gives the apparent magnification, so that the vertical lines can be spaced to represent vibrations of known amplitudes.

e.g. If the base of the triangle is 0.4" and the height 2" then the magnification is 10 (see diagram). The vertical divisions spaced at 0.1" will, therefore, represent a vibration amplitude of 0.01". In the lower drawing the intersection occurs at the eighth division indicating a vibration amplitude of 0.08". As the vibration amplitude is increased the apex of the shaded triangle can be seen to spread across the vertical divisions so that the amplitude can be quickly estimated.

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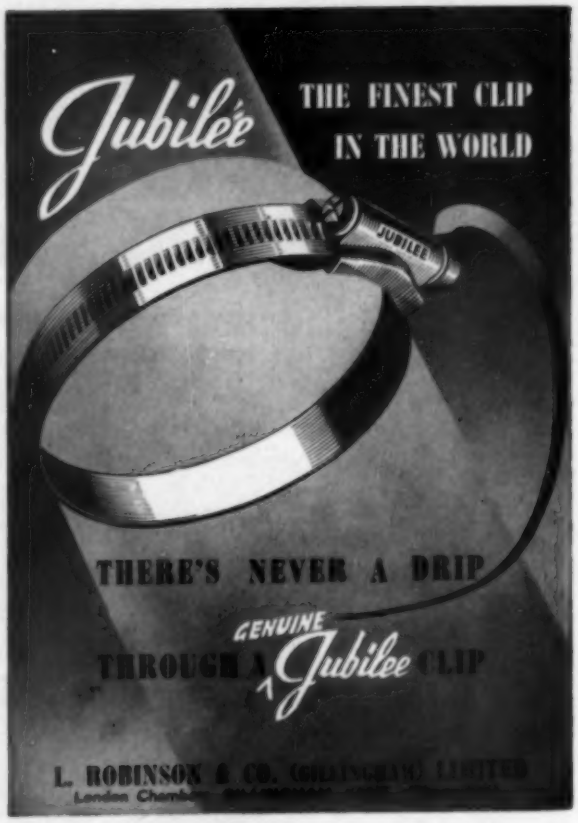

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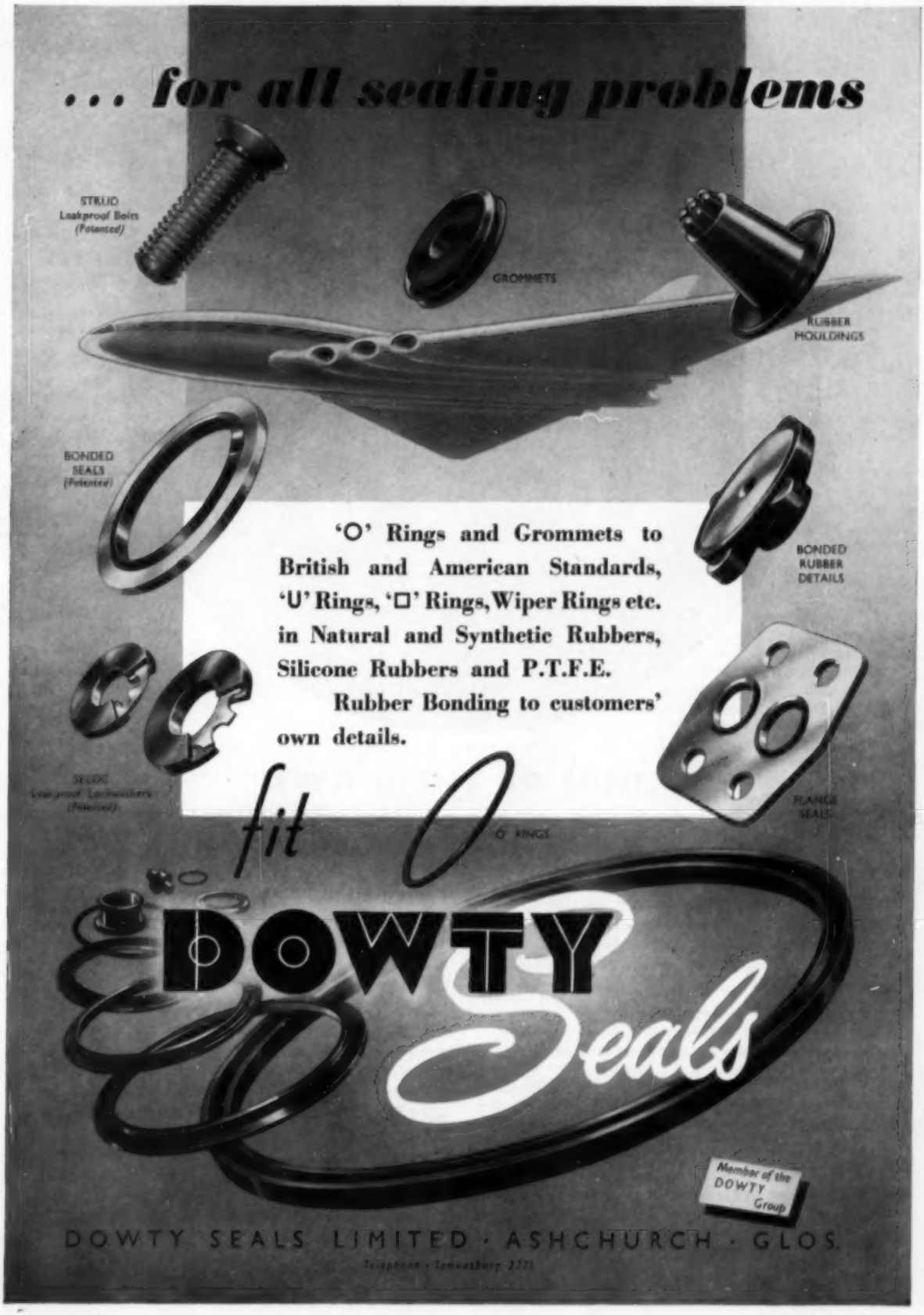
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Alternatively, an anti-aircraft shell would have small success unless it contained the pilot's ability to see and to think, and the aircraft's ability to turn, twist and chase.

In this dilemma was born the idea of the Guided Missile, a method of defence that is part shell, part aircraft, with more than human eyesight and computing power, but without human frailty under violent stress.

The development of such a weapon and the whole system associated with it poses enormous problems. In this work the ENGLISH ELECTRIC Group—English Electric, Marconi's and Napier—are far advanced. This is not surprising, for their combined resources and experience are exactly those required for this difficult work.

The past achievements and present activities of the Group in the Guided Weapons field are considerable, but the national interest demands that they be kept secret. Much remains to be done in the future. How long it will take will depend largely on the efforts of the highly qualified men guiding the research and development teams. Some of these men have long been working on the problem; more must now be found. They will have heavy responsibilities, great opportunities and the finest equipment.

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FIRST AERONAUTICAL WEEKLY IN THE WORLD FOUNDED 1909

FLIGHT and AIRCRAFT ENGINEER No 2444 Vol 68 FRIDAY 25 NOVEMBER 1955

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Scotland Pioneers

WHILE the transatlantic air has been reverberating to the thunder of super-colossal jet-propelled business the future of a more modest but nevertheless considerable aspect of commercial flying has been quietly shaping at Prestwick, in Scotland; for with the progress of the Scottish Aviation Twin Pioneer, subject of exclusive "In the Air" impressions in this issue, the advancement of short-field passenger and freight work will be largely identified.

The unique capabilities of this machine evoke admiration—that an aircraft of such eminent qualities should have been sponsored and developed by a comparatively small company; satisfaction—that the company should be British; and reflection—for the Twin Pioneer is significant not only in its own right, but as the harbinger of a new class of safe, economical transports.

The basic formula to which the new contender has been designed (full-span leading-edge slats and trailing-edge flaps, in conjunction with a low wing-loading) is not by any means original and can be traced back far earlier than the Fieseler Storch of the late war, which is generally acclaimed as the true progenitor. Its roots, in fact, stretch away into the 1920s, when experiments with various forms of Handley Page slot and other high-lift devices were leading up to the Guggenheim Safe Aircraft Competition, held in America in 1929. Requirements of the contest were a top speed of at least 110 m.p.h., a minimum speed of 35 m.p.h., and the ability to land in 100ft and take off in 300ft. Of 27 entries two only survived—our own Handley Page Gugnunc (now in the Science Museum as a monument to air safety) and an American machine called the Curtiss Tanager. Both were slotted biplanes. The Tanager ultimately won, and it is both enlightening and disquieting to compare its essential data with figures for the Gipsy-engined Scottish Aviation Prestwick Pioneer built some twenty years later and to which the present Twin Pioneer owes parentage. The Tanager had an engine of 170 h.p., carried three people, achieved a maximum speed of 112 m.p.h. and stalled at 37 m.p.h. The Gipsy-Pioneer had 250 h.p., took three or four persons, did 126 m.p.h. flat out and stalled at 33 m.p.h.

So much for aeronautical development after the way had been shown towards safe, slow flight from small areas without undue sacrifice in load or speed. So much for a "progress" wherein speed and range improved only with prejudice to landing and take-off performance—and inevitably to safety. So much for a present which sees, in the New World, a hundred Ford Trimotors—the "tin geese" of the 1930s—being laid down as short-field haulers; but which sees also (we may be thankful to the stalwarts of Prestwick) the same number of "Double Scotches" being set up for the sustenance of short-field operators.

—towards a New Future

It is a mistake, however, to look upon the Twin Pioneer solely as a bush-whacking device, for its characteristics commend it immediately as a sophisticated inter-city vehicle. Certainly the makers themselves have firm ideas on the subject. Mr. D. F. McIntyre, the managing director, recently declared that it was the "general clamour for helicopters" that had left his company in peace to develop the logical answer to the public's "fanciful expectations from helicopters"—a cheap, simple, fixed-wing machine which would do everything desirable, in a public-transport sense, that a rotary-wing aircraft would do and at a difference in cost which he estimated to be in the approximate ratio of 25:1. Overall time by Viscount from London to Paris, he pointed out, was 4 hr 5 min, whereas a Twin Pioneer taking off from Wormwood Scrubs and landing at the Champs Elysées could cut the time by 1½ hr and the fare by a third.

Mr. McIntyre's contentions will not go unchallenged, but the prospects are assuredly fair for a new family of short-take-off aircraft, larger than the Twin Pioneer no doubt, and having turboprops and high-activity airscrews. They might be succeeded by machines with boundary-layer control, or jet lift, or the jet flap—so numerous and promising are British technical developments.

FROM ALL QUARTERS

Hawker Siddeley Atomics

IT was reported last week-end that the Hawker Siddeley Group intend to establish a research station in order to conduct experiments in the general field of the application of nuclear power to aircraft. They have expressed an interest in acquiring 70 acres at Bulstrode Park, near Gerrards Cross, Bucks.

Confirming this information—which became public when the project was before Eton Rural District Council—a Hawker Siddeley spokesman said: "Any such development is a long way ahead, but the Group feels that it should not be behind in investigating the possibility for the future in this field." It was later stated—no doubt to set local fears at rest—that the work was likely to be concerned with the engineering, metallurgical and chemical aspects of the problem.

The only other British company known to be actively engaged in this field is Rolls-Royce, who have been at work on nuclear aircraft propulsion for over a year. Last March it was stated in a Parliamentary reply that "research into fundamental problems which govern the application of nuclear power to aircraft is being undertaken by the Atomic Energy Commission."

Tripartite Airliner

EARLIER reports of Bristol-Convair-Canadair negotiations on the subject of a large turboprop airliner for the 1960s were confirmed by a joint announcement from the companies concerned on Monday last, November 21st. The full text of the announcement was as follows:—

"The Bristol Aeroplane Co., Ltd., and the U.S. General Dynamics Corporation announce that following discussions between Bristol, Convair and Canadair in London, Montreal and New York, progress has been made towards long-term collaboration of their aviation interests, including as a first step work on a joint specification for a new, exceptionally long-range transport aeroplane.

"This new aeroplane, which will be in the 500 m.p.h. class, is designed around four Bristol B.E.25 turboprop engines. Like the Britannia 300 L.R. aircraft, it will have a genuine non-stop transatlantic range, enabling it to operate economically in both directions at all times of the year, whilst at the same time possessing excellent characteristics over shorter distances.

"A combined engineering group working at San Diego, with the background of the experience of Bristol on the Long Range Britannia, will complete the technical specification in January, when a further statement will be made. The intention of the three companies is that the aircraft and the engines shall be produced concurrently on both sides of the Atlantic."

At a time when multi-million-dollar jet orders are filling all available headline space, this announcement may not receive all the attention it merits. Its significance may become more apparent, however, as, during the years immediately ahead, the respective rôles of the big turbojet and turboprop airliner become more clearly defined. In endorsing Bristol's faith in the long-range, high-speed turboprop, Convair and Canadair have greatly improved its prospects of large-scale acceptance by the airlines.

Figures for the V.C.7

ILLUMINATING, especially when read in conjunction with the discussion of American and British jet transports on page 820, are makers' figures for the Vickers V.C.7, projected integral-tank civil version of the military V.1000. Essential characteristics are: Max. payload 25,000 lb; capacity payload 30,000 lb; max. fuel 105,000 lb + 550 gal water/methanol; basic operational weight 120,500 lb; max. take-off weight 247,000 lb; max. landing weight 164,000 lb; cruising speed 506 m.p.h.; still-air range with max. payload 5,400 st miles; take-off distance I.S.A. 7,300ft.

It is notable that maximum all-up weight would rarely be limited by take-off performance; theoretically London Airport could be used I.S.A. at 286,000 lb.

The payload-range curve shows that, in still air and with no allowances, maximum payload of 25,000 lb could be carried for 5,400 statute miles, or 15,000 lb for 5,750 statute miles. The London to New York payload, with full B.O.A.C. allowances, is 21,600 lb. Full payload could be carried over all Commonwealth routes.

Since the reason for rejection of the V.1000 was given as "a weight increase that had outstripped engine capacity," it must be noted that the Vickers figures include a possible (though, the makers consider, improbable) growth in structure weight of 7,000 lb. This would be met by the addition of two 600-gal slipper tanks, increasing fuel capacity from 105,000 lb to 110,000 lb; basic operational weight would increase from 120,000 lb to 129,000 lb, and maximum take-off weight from 247,000 lb to 266,500 lb.

The cruising speed of 506 m.p.h. is on the low side compared with the DC-8 and 707 figures, but wing area (3,267 sq ft) and wing loading (75.5 lb/sq ft) compare favourably. No mention is permissible of the thrust assumed for the Rolls-Royce Conway by-pass turbojets.

Sir Miles and Mr. Ferguson

STRONG Press opinion, most of it unfavourable, was excited by last weekend's news that Sir Miles Thomas, chairman of B.O.A.C., had joined the Board of Harry Ferguson Research, Ltd., a company formed to develop new ideas on the design of motor vehicles. Sir Miles said that he would be acting in an advisory capacity "on very much a part-time basis," making available to Mr. Ferguson the knowledge accumulated during his 27 years in the motor industry. His director's fee would be refunded to B.O.A.C.

This news, coupled with the announcement (reported on page 818 of this issue) that Mr. Whitney Straight's successor as deputy chairman of B.O.A.C., Lord Rennell, would serve on a part-time basis, evoked from the *Sunday Express* the furious comment that if Sir Miles and Lord Rennell could not give all their time to B.O.A.C. "they should get out of B.O.A.C. altogether and make room for men promoted from inside the Corporation." *The Times*, less bluntly, voiced doubts as to whether "the British Overseas Airways Corporation are arranging their highest affairs in a fashion calculated to cope with the testing time just ahead in world flying."

The timing of the announcement of Sir Miles's directorship

BACK FROM ARABIA (see page 802), the Blackburn Universal taxies-in at London Airport. On the left are some of the crew—Hunting-Clan and Blackburn—who took part in the remarkable airlift of oilfield equipment: (Left to right) Capt. R. B. Miles, Nav. Off. G. S. Seaton, Capt. L. B. Greensted, G/C. R. C. Hockey (in command of the operation), Capt. A. Limbert, R.Off. M. D. Newman, R. J. Chandler and E. J. Solman. The two last-named are from Blackburn and General Aircraft, the others from Hunting-Clan.

"Flight" photographs

was certainly unfortunate, coinciding as it did with the departure for Rolls-Royce of Mr. Whitney Straight, the Corporation's efficient and hard-working deputy chairman, whose services are not directly replaced. It is to be hoped that this gap will be filled by an executive with practical experience from the ranks of the Corporation. Had such an appointment been made, it is doubtful whether the Ferguson announcement would have created more than passing interest. Indications are that Sir Miles will not devote much time to the Ferguson concern, production of whose revolutionary vehicle is not expected to begin for many months. As things stand, however, the onlooker's impression has been that the management of a major national airline with a staff of 17,000 must leave barely enough time for relaxation—let alone additional business interests.

Civil Aircraft Expenditure

IN a written reply to a Commons question by Mr. George Wigg (Lab., Dudley) the Minister of Supply, Mr. Reginald Maudling, last Monday gave a list of the sums of money spent by his Ministry since the war on the development of specific types of civil aircraft. The total amount was £26m. Details were as follows:—

Air Horse, £350,000; Apollo, £1.25m; Brabazon, £6.5m; Comet 1, 2 and 3, £4.25m; Hermes, £1.3m; Princess, £8m; Sandringham, £120,000; Shetland, £1m; Solent, £100,000; Tudor, £650,000; V.1000, £2.3m.

In another written reply the Minister stated that the decision to cancel the V.1000 and order Britannias would save public money: their cost, even when added to any expenditure incurred with the V.1000, would be substantially less than the estimated cost of developing and completing six V.1000s for the Royal Air Force.

Hawker Strike Settled

IN its tenth week, the strike at the Hawker factory at Blackpool ended last Friday after the 2,000 strikers had voted, at a meeting two days earlier, to return to work. The decision was reached with a majority of three to one.

Before the Blackpool decision was known, meetings of employees at the company's works at Kingston-on-Thames, Dunsfold and Langley had passed resolutions that they would abandon the four-week-old go-slow tactics which they had been following in sympathy with the Blackpool men.

The strike, though closely watched and debated by the unions concerned, was an unofficial one. It arose in support of a demand for a 5d an hour bonus for night work, the Blackpool men claiming that they should be put on the same basis as their southern counterparts, who receive this sum. The stoppage and go-slow are understood to have seriously held up production of Hunters. Some of the strikers are said to have lost as much as £140 in wages.

There was no sign at the week-end of settlement of another major dispute in the aircraft industry—a strike of 7,500 workers at the three Scottish factories of Rolls-Royce, Ltd. The trouble, which began over a month ago, arose because one man earned "excessive" bonus payments.

G/C. W. A. Rollason

WITH the death on November 16th of G/C. W. A. Rollason, F.R.S.A., the British flying community loses a popular figure.

William Arthur Rollason was born on June 22nd, 1899, and educated at Mundella and Clarks. Early in the 1914-18 war he joined the Army, having "adjusted" his age to do so. In 1916 he transferred to the R.F.C. and was awarded his wings early in 1917; thereupon he was posted for service in France and Belgium, where he remained until the end of the war. The war over, he entered the car business, but in the early 1920s returned to flying and did much joy-riding with Avro 504Ks and D.H.6s. In the late 1920s he was flying from Brooklands and Ford for Dudley Watt.

During 1930 he transferred his flying interests to Croydon, and in the same year formed a company known as Rollason Aviation, Ltd., offering instruction on Gipsy Moths and undertaking joy-riding with Avro 504s and later with Desoutter cabin monoplanes (he took over the first Desoutter Mk II from Marcel Desoutter for this purpose). In 1933 he purchased a D.H.84, and, with a Desoutter Mk I and a Spartan open three-seater, toured Great Britain with British Hospitals Air Pageants, Ltd., himself flying the D.H.84. At the end of the tour, in October 1933, he formed another company called Rollason Aircraft Services, Ltd., and took in as a director Mr. F. A. Kent, formerly his chief engineer. The new company specialized in overhauling Moths and engines and achieved early success. By 1936 it employed about 700 workers and was engaged, too, in the reconditioning of Hart variants and in modifying Wellesleys, under subcontract to Vickers. In the same year the company was sold to British Continental Airways, who sold it to the Hunting Group in 1939.

***WAISTED SABRE:** This view of the special experimental F-86 built by Canadair for the R.C.A.F. and the National Aeronautical Establishment shows clearly the "area ruled" contours of the fuselage. A Ministry of Supply statement on area rule appears on page 808.*

Capt. Rollason (he was known by his World War I rank) remained with the company as director and general manager, resigning in August 1939 to rejoin the R.A.F. He was given the rank of squadron leader and was posted for duties with 43 Group, remaining with the Group until 1942, when he was transferred to Flying Training Command with the rank of wing commander. In this rank, during 1943, he joined the A.I.D. as A.D.A.I., being mainly concerned with the control of inspection at R.A.F. maintenance units. During his A.I.D. service he was promoted group captain.

When the late war ended he returned to Croydon and formed in turn three companies, first W. A. Rollason, Ltd., then Rollason Aero Engines, Ltd., and thirdly Rollason Aerocessories, Ltd. These companies are still actively engaged on sales and reconditioning of aircraft and engines, and in the design and manufacture of test equipment for the industry. They are now in the hands of G/C. Rollason's other directors, Messrs. Bennett and Millard.

G/C. Rollason leaves a widow, a daughter and a son.

Basil B. Henderson

WITH deep regret we record the death of Mr. Basil B. Henderson, an aircraft designer and engineer of note. He was born in Dulwich in 1902 and educated at Tonbridge and Caius College, Cambridge. From 1924-28 he was on the technical staff of A. V. Roe and Co., Ltd., and when that firm decided to close down the Hamble works he resigned his position and in 1928 formed, with Mr. H. A. Miles, the Hendy Aircraft Company. During 1929, in a small shed at Shoreham, Henderson and Miles constructed the Hendy 302 low-wing cabin monoplane, embodying a new type of wing spar construction developed by the former. Known as the Hobo, the little machine was a single-seater with a 40 h.p. A.B.C. Scorpion engine. There followed in 1930 the Hendy 302 cabin machine, a tandem two-seater of notably clean design, construction of which was undertaken by George Parnall and Company, of Bristol. In the King's Cup Race of 1930 the 302 was flown by Capt. Edgar Percival, who had by then joined forces with Henderson and Miles (they to do the actual design work and he to contribute practical advice), and, had compass trouble not been experienced, the machine might have secured second place.

The last design of the Hendy Aircraft Company was the Heck, completed in 1934 and technically interesting for the thorough application of Handley Page slots and trailing-edge flaps. The prototype was built by George Parnall and Co. and was taken over by Parnall Aircraft, Ltd. A small batch was put into production. The Heck was notable for its speed range of 40-170 m.p.h., and in 1935 set up a new record for the South Africa to England flight (F/O. David Llewellyn). Mr. Henderson was subsequently appointed chief designer to Parnall Aircraft, Ltd., and the last of his designs to be constructed was the Type 382 tandem-seat trainer, with D.H. Gipsy Six engine.

In the late pre-war years the company acquired the patents and pending contracts relating to Nash and Thompson armament devices—particularly turrets. It was on a Heck that one of the first wing-mounted installations of Browning guns was made in this country—an installation which provided invaluable data for the Hurricane and Spitfire eight-gun schemes.

During the war years Mr. Henderson's work was mainly concerned with Parnall power-operated turrets. Thereafter he spent a period as a consultant and in March 1950 joined Boulton Paul Aircraft, Ltd., being responsible for co-ordinating the sales of powered controls and other hydraulic devices. On leaving that company, in June 1953, he joined the Denison Engineering Co., of Columbus, Ohio.

"Flight" photograph

AUSTER J5R ALPINE

A Willing New Type for the Tropics

By C. M. LAMBERT

THE latest addition to the range of Auster aircraft, the J5R Alpine, has been specially developed for operations from high-altitude fields in hot climates. It consists mainly of the combination of the Aiglet's fuselage with the Autocar's wings; but other modifications, including more effective ailerons, have given it quite outstandingly good handling qualities and a standard of comfort better than that of other models.

The Autocar has a capacious cabin and large payload capacity, but in tropical climates and at high take-off altitudes these often cannot be fully used. The Alpine's rear-cabin accommodation is therefore scaled down while the large wing and powerful engine are retained, resulting in take-off and landing characteristics which are excellent for such operations. Yet the new aircraft is more comfortable, for the Aiglet front seat gives more leg-room and elbow-room than that of the Autocar; and deep cushions, shaped to give pleasant support in the small of the back, have been added. The fact that the full 42.5in cabin width of the Aiglet is also retained means that two large people can be very comfortably seated. A rear bench-seat will accommodate a third person. Yet both the right-hand and rear seats can be removed to make room for bulky freight or for a stretcher. There are also four adjustable ventilators which will mean much in the tropics, while sunblinds covering the whole of the roof Perspex are optional to order.

The cockpit features which made the Aiglet suitable for training flying are retained, including the guard over the front passenger's heel-brake pedals which, incidentally, make a very comfortable foot-rest.

The most remarkable improvement is the fitting of ailerons with greater balance area and modified shrouds, which make lateral control really good at all speeds—and this is in comparison with other types of aircraft as well as with previous Austers. I was particularly impressed with the Alpine's responsiveness at the lower end of the speed range. It is a really significant advance.

There are in fact two versions of Alpine, the J5R with the de Havilland Gipsy Major 10 of 145 h.p., and the J5Q with the Major 1 of 130 h.p. It was the J5R which I flew last week at Rearsby, and I was most impressed.

My first introduction to it was as a passenger, as Ranald Porteous, Auster's chief test pilot, presented it in lively fashion for *Flight's* photographer, L. W. McLaren, who was standing on a corner of the airfield. We darted and zoomed past the camera and, after landing alongside to consult, took off again for some close passes with one wheel practically on the ground. A pilot must have a reputation as good as Ranald's before Mac will stand for that sort of treatment. I was already impressed with what I could see of the Alpine's handling.

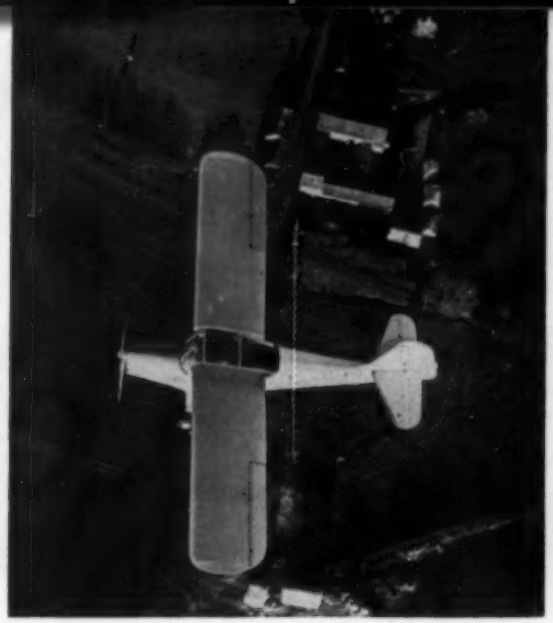
When McLaren's hair was thoroughly ruffled, Ranald took him up in another Auster so that he could take some air-to-air pictures of me flying the Alpine. The door beside him was removed to give his camera full play and he was further blown about as he took aim and then gestured instructions to me.

On the ground I had settled myself comfortably in the Alpine, turned on the battery and magneto switches, given a few strokes of the primer and pressed the button. The engine started easily once I had been shown how much to prime it, and I released the car-type handbrake and began taxying. Visibility over the nose was not unduly restricted by the engine and not much weaving was needed to keep the ground ahead in sight. Engine control was positive and I found the heel brakes comfortable and effective to just the right degree. At about 1,000 r.p.m. the aircraft responded fairly well to application of rudder alone. The roll was quite smooth and comfortable.

I lined up for take-off and carried out the normal sequence of checks, selecting the port tank and one-third flap. The large knurled wheel for throttle friction adjustment is a good feature. Take-off itself was completely straightforward—a firmish forward pressure to raise the tail and a touch of port rudder to counteract a very slight swing. Ground run was 10 sec or less and very short. At 40 m.p.h. indicated I eased the control column back to unstick, with excellent elevator control immediately available. The rudder was light and little movement was required in any flight condition. Harmonization of all controls was good, with the ailerons the stiffest of the three. Raising of the flaps caused

"Flight" photograph

"Ranald Porteous, Auster's chief test pilot, presented it in lively fashion for 'Flight's' photographer, L. W. McLaren . . ."



This view shows to advantage the plan form of the Alpine's wing, which is similar to that of the Autocar.
"Flight" photograph

virtually no trim-change and the very minimum of sink. The climb-out at full power and 70 m.p.h. gave 2,200 r.p.m. and a good 1,000ft/min. The elevator trim was powerful and positive and quite sensitive; and plenty of it was available for holding all flight configurations. I found it best to take off with a fraction of nose-heavy trim and no adjustment was necessary after retracting the one-third flap. The angle of climb was very steep. Climbing turns were easy.

Without making any specific tests I came alongside the photographic aircraft and posed a little shakily, peering round the port wing-root the while. I then broke away, climbed to 2,000ft, and trimmed for level cruising at 2,300 r.p.m. Trim change as speed built up was very slight and it settled at 118 m.p.h.—better than the book figure of 112 m.p.h. When the trim is carefully adjusted the Alpine bores along very steadily hands off.

Trimmed for cruising, I pulled the nose firmly 10 deg up, then let go. The nose fell very slowly and speed increased 5 m.p.h. as it dipped below the horizon. After two very gentle phugoids, it had virtually returned to the trimmed attitude. Pushing the nose down 10 deg resulted in a slow phugoid which gave speed variations of about 15 m.p.h. but damped out more quickly. I next tried pressing lightly on the ailerons. Results were good and the Alpine banked gently and the nose moved steadily to one side and began to drop below the horizon quite soon. Releasing the pressure stopped the roll to starboard and the nose began its gentle phugoid. To port there was some control friction because the aircraft was new, and the stick had to be positively moved back to centre to obtain the neutral stability characteristics. I particularly appreciated the fact that application of aileron alone did not cause any yaw in the opposite direction, although the ensuing turn had some outward skid registered by the top needle. I retrimmed and tried pushing each rudder pedal alternately with the stick free. The yaw was positive and bank followed it almost immediately. After some three applications the nose had risen somewhat against the horizon, and then it dropped as a gentle phugoid began to build up over the yawing. Letting go of the pedals resulted in its straightening-up immediately and continuing slightly to one side of the trimmed heading; fore-and-aft and directional stability were pleasantly positive and lateral stability neutral. The Alpine's cruise is steady and firm and the excellent response of all controls augurs well for its handling in rough weather conditions.

I next slowed to 65 m.p.h. at 2,000ft, holding height on 1,500 r.p.m. There was a slight change of directional trim which was held on the rudder with no perceptible effort, and a slight nose-up change of attitude also occurred. I repeated all the tests detailed above at this speed and power, and found the results remarkably similar, but with rather lighter stick-forces. Response was still very good indeed and the Alpine's stability appeared completely unchanged.

Steep turns were perfectly simple at both speeds, with no need to hold the nose high above the horizon in order to maintain height. At the slower speed a little opposite aileron was required to prevent bank angle increasing. At 65 m.p.h., also, a co-ordinated turn could be made with the ailerons alone. The nose dropped slightly after 20 deg and rose again after 270 deg.

Stalls were next on the list. I slowed right down to 40 m.p.h. and found control response to be excellent in all axes. Steep turns and porpoising brought no hint of judder and I could immediately put the Alpine into any reasonable attitude under full control. At 1,500 r.p.m. and 40 m.p.h. at 3,000ft, I had no difficulty at all in trimming to fly hands-off. The rudder had to be held some way over to the left to counteract torque, but the aircraft flew absolutely steadily without any attention and with the nose way up in the air.

I closed the throttle and went back to the stall, which came with a definite buffet and no violent change of attitude at about 38 m.p.h., flaps up and power off. If the stick was held firmly back the wing tended to drop either to left or right very gently, but there was no trace of an incipient spin. After a few seconds, the nose had dropped slowly down sufficiently for speed to build up to about 55 m.p.h. and a gentle, mushing descent followed. Recovery after the stick was pushed forward was practically instantaneous, with or without power; height loss was in the region of 150ft, although this could probably be reduced if action was taken as soon as the buffet occurred. Right down to the stall, control response in all axes remained positive and immediate. Stalling with one third and then full flap, power off, reduced the stalling speed to a final 34 m.p.h. with no change in the characteristics.

After about four stalls and a good deal of really slow flying I made a long dive at about two-thirds power. As speed increased there was a gentle, even and progressive nose-up trim-change and controls became somewhat heavier, but not unduly so. There was more than enough trim available to relieve the stick force. The limiting diving speed is 160 m.p.h., but the build-up after about 145 m.p.h. is quite slow. I then trimmed the aircraft again into a standard full-power climb and cut the throttle. There was little trim-change and ample elevator control remained to pitch the nose forward or pull it back even further. The speed did not fall off unduly quickly.

Now ready to try some circuits, I entered the downwind leg at about 100 m.p.h. Closing of the throttle gave good deceleration down to the flap-lowering speed of 70 m.p.h. Application of one-third flap resulted in a very slight nose-down trim-change, and after adjusting it I found no need at all to make any further adjustments all the way down to the ground. A glide approach at 60 m.p.h. was pleasantly steep and comfortable and the aircraft went where the nose was pointing. Aileron control was particularly good in the glide, and this characteristic should be a tremendous help in bumpy conditions. Over the hedge the speed came quite naturally back to 50 m.p.h. and there was ample elevator control for a really precise round-out and touch-down. The wings could be rocked and sharp reversals of bank applied on the final approach without any difficulty. Sideslipping was easy and there was no apparent tendency for the nose to fall away uncontrollably. Touch-down itself produced no marked desire to bounce: there was so much control, even at this juncture, that a good hefty kangaroo step should cause no trouble to the pilot. A second take-off and landing immediately served to confirm these impressions.

Altogether the Alpine has remarkably good control at very low speeds, a very useful cruising speed, and trim-changes which are in all cases slight and completely normal. I did not at any time require anything like the full range of trim available. These characteristics, together with the simplicity and ruggedness of the airframe and a very comfortable cabin layout, should make the Alpine much sought after for tropical and high field operations. I for one would be quite prepared to forgo the luxuries of some American private-owner types when for less money I could obtain an Alpine, which has very much better handling characteristics, a performance tailored for rough work and a simplicity which offers low maintenance costs and really worthwhile flexibility of load and utilization. I was more impressed by the Alpine than by any other Auster type to date.

AUSTER J5R ALPINE
145 h.p. de Havilland Gipsy Major 10

Span		36ft
Length		23ft 2in
Height		6ft 6in
Tare weight		1,332 lb
Performance at	Typical load (1,827 lb)*	Max. load (2,250 lb)†
Maximum I.A.S.	128 m.p.h.	126 m.p.h.
Maximum cruising speed	112 m.p.h.	111 m.p.h.
Stalling speed	31 m.p.h.	35 m.p.h.
Ceiling	22,000ft	17,000ft
Still-air range at 2,150 r.p.m. (approx. 101 m.p.h.)	460 miles	455 miles
Distance to unstick (at 4,000ft, 5 m.p.h. wind)	135 yd	220 yd
Distance to clear 50ft (at 4,000ft, 5 m.p.h wind)	275 yd	445 yd
Sea-level rate of climb	1,025 ft/min	700 ft/min

* Pilot, passenger, 16 gal fuel. † Pilot, two passengers, 100 lb freight, 32 gal fuel.

HIGH MACH: A new and dramatic view of the Fairey F.D.2 60-deg research delta, powered with a reheat Rolls-Royce Avon turbojet and easily capable of supersonic speed on the climb.

HERE AND THERE

Bell X-2 Under Power

THE Bell X-2 rocket-propelled research aircraft, which should easily surpass the performance of its 1,650 m.p.h. predecessor the X-1A, flew under power for the first time on November 18th. It was launched from a B-50 over Edwards Air Force Base, California, and flew for six minutes "in the area of the sound barrier".

Olympian Height Confirmed

THE Royal Aero Club announced on Monday that the F.A.I. had confirmed W/C. Walter Gibb's height record of 67,890ft, established in the Olympus-Canberra on August 29th. W/C. Gibb was being entertained at a house dinner of the Club last Tuesday evening.

The Magic Crane

HELICOPTERS have been playing an important part in the construction of a hydro-electric station in the Swiss Alps. In an airlift between the village of Linthal (2,135ft) and the Limmerboden Alp (6,565ft) 480 two-way flights have been made, carrying 206 men and 120 tons of equipment, which has included such bulky loads as pre-fabricated house sections. Each trip would have taken five hours by road; by helicopter it took 15 minutes.

West Kenya Air Show

AN impressive flying programme is being arranged for the West Kenya Air Show on January 7th and 8th, 1956. The meeting will be opened by the Deputy Governor, Sir Frederick Crawford, and events will include formation aerobatics by Venoms of No. 73 Squadron; demonstrations by the Kenya Police Air Wing and by an R.A.F. Canberra; sky-shouting by the R.A.F., from a Hunting Percival Pembroke; demonstrations of spraying and dusting by Airspray (East Africa), Ltd.; and—of special interest to the vintage enthusiasts—flights by a D.H.51 built in 1925. Additionally there will be mass air drops by the R.A.F.

Sixty Years of Motoring

OUR associated journal *The Autocar* is celebrating its 60th year of publication with a special Diamond Jubilee Number on December 9th. Among the contents—which touch on motoring highlights through the years—will be a description (with cutaway drawing by Max Millar) and road test of a famous 1903 car.

Synthetic Rubber Project

FOUR leading tyre companies—Dunlop, Goodyear, Firestone and Michelin—are subscribing to a joint project to make general-purpose synthetic rubber. A company has been formed under the title of the International Synthetic Rubber Co.; eventual capital may be £9m. It is hoped to start production in 1958, with an output of about 50,000 tons a year—about a third of the annual rubber requirements of the British tyre manufacturing industry.

Watertight Alibi Dept.

COMMENTING on the question—raised in the House of Commons— of the inclusion of a shot of a Flying Fortress in the American release of *The Dam Busters* film, Mr. Robert Clark, the producer, is reported to have said that it was "just a flash of two seconds" inserted to "make things clearer to American audiences." He was satisfied that it in no way detracted from the epic raids of the R.A.F.; only a highly trained viewer could have spotted the aircraft and he thought it would "pass undetected by half of the Observer Corps." We await the reactions of the R.O.C. with interest.

Japan Looks Round

THREE members of the management of Japan Airlines are to visit aircraft factories in the United States and United Kingdom in order to collect data from which the company can decide its future purchases of equipment.

Thinking It Over

ISRAEL'S request to America for arms was "still under consideration" said a State Department announcement last week. Details of the request were not revealed, but it is unofficially reported in Washington that the aircraft section of the list specified 40 or 50 F-86s to balance the Migs which Egypt is receiving from Czechoslovakia.

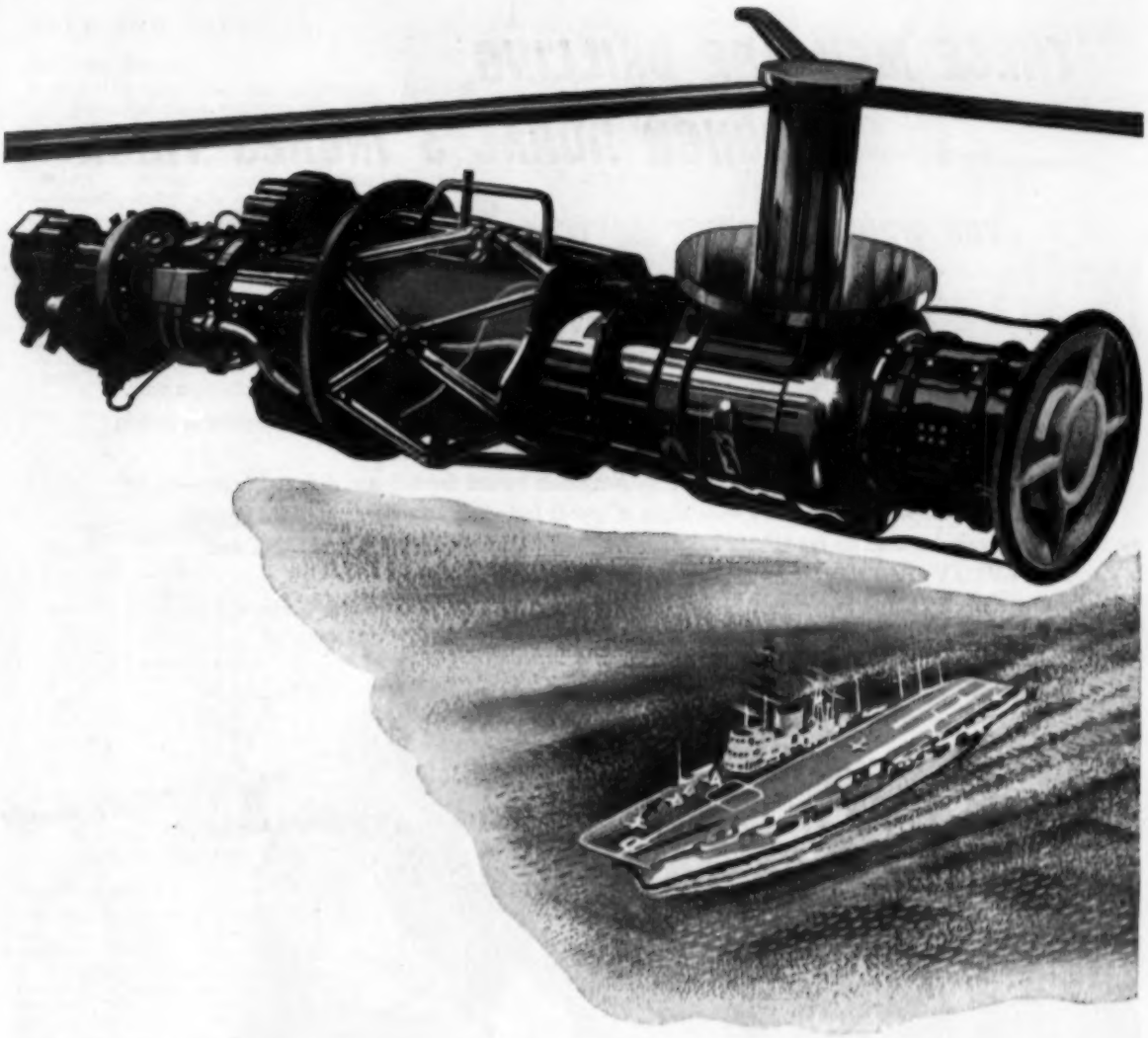
Republic in Europe

TO administer their expanding activities on the European continent, Republic Aviation have appointed Maj. Gen. Alden R. Crawford, U.S.A.F. (Retd.), vice-president for operations in Europe. For some time he has been serving as vice-chairman and general manager of Republic Aviation International, S.A., with headquarters at Lugano, in Switzerland. He is succeeded there by Robert E. Minton, who has been facilities co-ordinator at the head office in Farmingdale, N.Y.

Interest in India's Industry

VISITING India, Mr. Adamek, chairman of the Czechoslovakian Chamber of Commerce, has indicated his country's willingness to assist India in establishing its jet aircraft industry. Hindustan Aircraft at Bangalore, owned by the Indian Government, is known to be engaged in the development of an advanced jet trainer. One of the company's existing HT-2 trainers, incidentally, is at present making a demonstration tour *via* Bangkok, Cambodia, Penang, Kuala Lumpur and Singapore.

NOT A TANK, as might be supposed, but a "starting pod," the appendage seen here on a McDonnell F3H-2N Demon contains a gas turbine which compresses air for actuating the starter. The fitment is of particular value during ferrying flights or at bases where starting equipment is not available.



The heart of a good helicopter

A helicopter engine that works without driving shafts and driving gear—that's the Napier Oryx. It's a 750 gas h.p. turbo-gas-generator, designed for helicopters propelled by jet reaction at the rotor blade tips. It weighs less, it's less complex and it's easier to maintain than conventional helicopter power systems. The Oryx is a step forward—and upward—in helicopter propulsion, and an engine of great importance to helicopter operators.

NAPIER **Oryx** turbo gas generator

D. NAPIER AND SON LIMITED · LONDON · W.3.

D

THESE MEN ARE DRILLING THROUGH DURAL 3 INCHES THICK

YOU WOULDN'T THINK SO TO LOOK AT THEM, WOULD YOU?

They aren't shoving and sweating and straining. They're using the new *Desoutter Pneumatic Rackfeed Drill* and doing the job easily, quickly and accurately.

It has a geared rackfeed which enables a load of 250 lbs. to be applied with finger-tip pressure only.

It has a bayonet nose attachment which locks on to the jig plate and makes correct alignment certain — even where the operator is unskilled.

It starts and stops automatically: it has interchangeable bushes for different diameter holes — *up to ½" if you like:* it is available in a wide range of speeds including very slow speeds for reaming.

It is now being used on the HANDLEY PAGE VICTOR, the VICKERS VALIANT and the AVRO VULCAN.

Write for descriptive leaflet: ask us to arrange a special demonstration at your works.

No! We haven't slipped → up here. At this joint of the crescent wing on the Handley Page Victor there are changes in both dihedral and angle of sweep. This makes the drill look as if it's tilted over, but in fact it's perfectly square to the surface at that point.
Photograph by courtesy of Handley Page Limited.

Desoutter RACKFEED DRILLS INCREASE AIRCRAFT PRODUCTION

DESOUTTER BROS., LTD., THE HYDE, HENDON, LONDON, N.W.9. TEL: COLINDALE 6546 (5 LINES) 'GRAMS: DESPNUCO, HYDE, LONDON
CRC 26M

HERE AND THERE . . .

Hercules School

A FLIGHT Crew Training School for U.S. pilots and flight engineers who will operate the Lockheed C-130 Hercules of the U.S.A.F. is being opened by the Lockheed-Georgia aircraft plant at Marietta. Ground school and flight transition training will be provided for nearly a hundred pilots and flight engineers.

S.L.A.E. and C.G.L.I.

FOLLOWING the liaison established between the Society of Licensed Aircraft Engineers and the City and Guilds of London Institute, the S.L.A.E. is now offering annual cash prizes for the best examination results in C.G.L.I. syllabuses No. 174, Aircraft Servicing and Maintenance, and No. 175, Aircraft Electrical Maintenance.

"Look, sir, the helium bomb."

Fish Freight

PEOPLE of the growing towns and communities of N.W. Queensland and the Northern Territory could hardly imagine a few years ago having fresh sea fish as food, but an air freightage scheme has made this possible. The fish—some 20,000 lb a month—are caught in the Gulf of Carpentaria, transported to Normanton, and then flown in chartered refrigerated aircraft to Mount Isa, the big mining town, for distribution. The Queensland State Government pays 6d per lb subsidy on the air freight between the Gulf and Mount Isa.

STAND FROM UNDER! Aerial top-dressing of pasture land, as widely practised in New Zealand, can be spectacular. The aircraft is a Piper PA-18-A operated by Airwork (N.Z.) Ltd.

Encouraging Expression

IN order to encourage a greater flow of technical articles from within the radio and electronics industry, the Radio Industry Council has decided to present six annual premiums of 25 gns each for writers —who must not be professional journalists —of such articles. Details are obtainable from the Radio Industry Council, 59 Russell Square, London, W.C.1.

Australia's Aluminium

A PLANT has lately been inaugurated in Tasmania which will produce enough aluminium to meet all Australia's peace-time needs. Located at Bell Bay, near Launceston, it has taken seven years to build and cost £A10½ million. The opening ceremony was performed by the Minister of Supply, Mr. H. Beale, who poured the first ingot bearing the imprint of a boomerang, which is the trademark of the Australian Aluminium Production Commission. The Opposition Leader in the Federal Parliament, Dr. Evatt, described the project as vital to Australian defence.

For Yorkshire Spotters

A RECOGNITION contest is being held by York Aviation Group on January 7th, with a team trophy as well as an individual prize. Details from Mr. M. Cox, 12 Green Lane, Acomb, York.

Canada's Missile

EXHIBITED by Canadair at the Air Industries and Transport Association's annual meeting at Quebec recently was a guided missile on which test firings are continuing. The original design was by the Canadian Armament and Development Establishment (CARDE) at Valcartier. Successful ground and air launchings (the latter from F-86s and CF-100s) have been made.

Reindeer and Helicopters

REINDEER herds in the tundra of northern Siberia are being supplied with fodder from helicopters. In addition, *kolkhozes* (collective farms) in isolated snow-bound districts are being kept operational by helicopter lifts of medical supplies, fresh vegetables, mail and—naturally—copies of *Pravda*. Another report, from Eastern Europe, says that five landing stages for helicopters are being built which will provide for helicopter services between the centre of Warsaw and the suburbs.

MINISTERIAL GUEST: A recent visitor to the Gloster factory was Lord Carrington, Parliamentary Secretary to the Ministry of Defence. In this group are seen, left to right, Mr. R. V. Atkinson works director (Gloster Aircraft Co.), Mr. E. W. Shambrook (director and secretary), Mr. P. G. Crabbe (managing director), A. Cdre. Silyn Roberts (Director of Aircraft Research and Development, M.o.S.), Lord Carrington and Mr. G. Wheeler (Under-Sec., Min. of Defence).

African Radar Chain

JOHANNESBURG RADIO reported recently that the British Colonial Office has agreed to allow South Africa to carry out surveys for sites for radar stations forming part of a radar defence chain in the territories situated north of South Africa, i.e., Bechuanaland, Swaziland and Basutoland. The report added that during the last session of the South African Parliament Mr. Francois Erasmus, Defence Minister, announced that such a chain will be built to form part of South African defence arrangements. Five million pounds sterling has already been set aside for the purchase of equipment.

Small Town, Big Airfield

BUILT as a heavy-bomber base during the war, an airfield near Katherine, 220 miles south of Darwin, Northern Australia, may be reopened to serve the little town as an airport. It has a 150-ft main runway, 2,500 yards long.

MARKET SURVEY

Airliners: a Study of Supply and Demand

By ROBERT J. BLACKBURN

IN recent months it has frequently been pointed out that, where production of civil aircraft is concerned, a large and expanding home market is essential to a healthy industry. Equally, it is more widely appreciated than ever before that the scale of airline operations under the United States flag is the main reason for America's continued leadership as a supplier of civil transport aircraft.

Just how large is the American share of world air transport may not, however, be generally realized. The accompanying diagram, based on statistics published by I.C.A.O., shows the proportions of air-transport production (ton-miles offered for sale on scheduled services) as distributed between North America, Europe, South America, Australia, the Far East, Near East and Africa during 1954.

The North American share of 64.5 per cent of all ton-miles offered does, of course, include the output of Canadian operators. United States airlines alone, however, were responsible for nearly 60 per cent of ton-miles offered, 57 per cent of ton-miles sold and 59 per cent of passengers carried on the world's scheduled air services in 1954.

Of the remaining 64 member-states of I.C.A.O., none produced more than 5 per cent of the total. The major producers, listed according to their respective shares of the ton-miles offered on scheduled services in 1954, were as follows: France (5 per cent); the United Kingdom (4.5); Australia (4); Brazil (3.5); the Netherlands (3); Canada (3); Mexico (2); Scandinavia (2); Colombia (1.5); India (1); and Switzerland (1).

Incidentally, the fact that a dozen of the better-developed nations accounted for more than 90 per cent of the I.C.A.O. total stresses the relationship between air transport and national prosperity. It is also significant that international air services represented one-third of world air traffic, whereas United States international services accounted for only 20 per cent of total U.S. traffic.

These figures show beyond doubt that, Russia and China excluded, the United States is the only part of the world where a large air-travel market and a large manufacturing industry exist side by side, united by nationality and geography. Two further advantages enjoyed by the U.S. manufacturers are the indirect assistance of large military contracts and the fact that their competitors are widely dispersed and, relatively speaking, poorly supported in both the civil and military sense.

International traffic figures and fleet lists show that more than 90 per cent of all scheduled traffic is still carried in aircraft of U.S. design and manufacture—which is hardly surprising, in view of the factors mentioned above. The effect of these factors can be seen in practical terms by studying the operating statistics of the I.A.T.A. airlines in 1954. These airlines carried 85 per cent of scheduled I.C.A.O. traffic. About 50 per cent of I.A.T.A. traffic was carried by five large American operators—A.A., E.A.L., P.A.A., T.W.A. and U.A.L., the remaining 50 per cent being shared between 65 other I.A.T.A. carriers. The moral of these figures is plain: that U.S.-built aircraft will continue to carry a majority share of traffic until (a) the large American operators look beyond the United States for their equipment or (b) operators using, or intending to use, non-American equipment increase by a handsome margin their present small proportion of world traffic.

There is at present no evidence to suggest that such drastic developments could take place inside the next ten years. For the past year or so, the West Coast manufacturers have been selling more aircraft, at higher prices, than ever before. A decline from this position of strength could not happen overnight, however unsuccessful the future efforts of the American manufacturers and however fruitful those of their rivals.

Of the scores of aircraft-types in scheduled service today, about a dozen are carrying the bulk of the traffic.

	Approx. No. in I.A.T.A. Service Dec. 1954	Dec. 1957
Douglas DC-3	730	500
Douglas DC-4	260	200
Douglas DC-6/7 series	400	700
Lockheed Constellation	180	180
Lockheed Super Constellation ...	90	160
Convair 240-340-440 series	260	400
Martin 2-0-2—4-0-4 series	120	120
Boeing Stratocruiser	50	50
Vickers Viscount V.700-800 series ...	40	250

The foregoing approximate figures illustrate the "balance of power" between manufacturers as represented by numbers of aircraft in scheduled service with I.A.T.A. airlines. For the sake of simplicity, totals are given in round numbers, and the estimates for 1957 are based on orders announced to date.

By 1957, the Viscount will be firmly established in the world market. In view of our preceding remarks on overwhelming size of the American home market and its effects on airliner sales, the significance of the Viscount's success can be appreciated to the full. It proves that the lack of a huge home market need not necessarily close the door on big overseas sales. The success of the Viscount, however, must be partially offset—so far, at least—against the relative failure of other types of aircraft of non-American manufacture to sell on a large scale.

These words are not written either to laud the American industry or to decry the efforts of its competitors, British or otherwise. The writer's object is simply to record some under-publicized facts about the size of the air-transport market and its sources of supply.

Over the past ten years world air traffic has expanded at a faster rate than United States traffic. If this trend continues, as it almost certainly will, the *relative* size of the U.S. market will decline or—more positively—the size of the remaining section will increase, improving the sales prospects of British manufacturers.

Moreover, the American air-transport system is at a more sophisticated stage of development than in most other areas—*i.e.*, it approaches the ideal of both high frequencies and large vehicles. With the new jet transports, design-for-purpose has reached the stage where the long-haul requirements of the U.S. and overseas markets are not easily reconciled in the one type of aircraft. The DC-8 and the Boeing 707 may well prove too large and too expensive for many operators, particularly those just beginning to flex newly acquired wings in the international field.

To a greater extent than is generally realized, the pattern of re-equipment programmes is determined more by the designer than the airline operator. The demand for new equipment is created largely by existence of that equipment. After all, if design were static, air transport would not die. Operators could acquire the capacity needed to handle extra traffic simply by buying additional aircraft of a type already in service. Basic reasons why an operator buys a new type of aircraft are: (1) to capture or regain traffic from a competitor; (2) to reduce deficits or increase profits, as the case may be; (3) to handle new routes too long or too short for present equipment; (4) to replace or supplement a type of aircraft no longer in production.

The extent to which an aircraft will sell therefore depends on its

Distribution of scheduled air traffic, based on I.C.A.O. statistics.

Marconi Multi-Channel VHF Aircraft Communication Equipment

TYPE AD 115

The equipment consists of main transmitter/receiver unit and one of two types of controller unit, according to the method of operation. The main unit (left) is built up of receiver, drive, transmitter and power sub units. On the controller unit (right) the required channel is selected by the operation of two switches which actuate an automatic switching device.

The type AD 115 equipment is a remotely controlled transmitter/receiver which provides:

- 140 transmission and reception channels, 100 kc/s apart, in the frequency range 118-132 Mc/s.
- Transmission and reception on same or different frequencies.

Features include

- Direct reading frequency scales on the controller to ensure rapid channel selection.
- No valves or crystals in the controller.
- High powered transmitter provides 12-20 watts output power throughout the band.
- Special crystal economiser circuits which enable 24 crystals to provide 140 channels.
- Efficient squelch circuit to eliminate receiver noise when no signal is received.
- Full metering facilities for stage checks to enable rapid servicing.
- Accessibility of sub-assemblies.

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In south-east Arabia, vital oil well drilling equipment has been transported by air from the coast to the operational site in the barren desert. The direct surface route was impassable, the alternative being twelve hundred and fifty miles of slow transport by sea and then by specially designed vehicles over rough desert.

Single items of equipment weighing as much as 16½ tons, some of 9 feet in diameter and others over 40 feet long have been delivered by a Blackburn "Universal" air freighter. Each load was flown to the oil drilling site in under two hours.

These large, indivisible loads could be carried by no other aircraft using the landing grounds available. These were roughly graded, unsurfaced desert strips.

THE *Universal*

Blackburn and General Aircraft Limited. Brough, E Yorks. England

MARKET SURVEY . . .

competitive appeal, its operating cost and its route characteristics. The emphasis placed by the designer on these three qualities will, in turn, depend on the section of the market for which the design is offered.

In the design of the DC-7C, for example, the emphasis was on range; the all-important feature of the aeroplane is its non-stop North Atlantic capability. Its competitive appeal to both operator and passenger depends almost entirely on the ability to fly from Europe to North America without a refuelling stop. On no other international route is traffic heavy enough, or competition keen enough, to justify so specialized a design.

At the other end of the range scale there are small aircraft designed specifically to operate short stages and owing nearly all their sales-appeal to this fact. Obvious examples of this category are the S-55, the Beaver, Otter and Twin Pioneer.

The bulk of traffic is carried, however, by aircraft of more conventional formula, operating neither ultra-short nor ultra-long distances and not depending too strongly on any one quality for their survival in the sales race. The basis of a best-seller is all-round performance, coupled with reliability and a lower ton-mile cost than its competitors over the widest possible band of stage lengths. Proof of this assertion, if required, is furnished by the immense share of the market captured by Douglas with their DC-3, -4 and -6 series—all unspectacular, bread-and-butter aeroplanes.

In the Britannia, Comet, Vanguard, Viscount, Herald, Accountant and Twin Pioneer, Britain appears to have an ample range—almost over-ample, perhaps—of products with which to make a fresh assault on the market. Past experiences have made us a wiser if sadder nation, but to achieve maximum results we need more than a re-stocked shelf. We must freshen the jaded philosophy which has to some extent been responsible for past setbacks.

The first essential, surely, must be to clear away confusion as to our motives. The purpose of selling aircraft abroad is to make money, and the more aircraft we sell the more money we shall make. We must put aside vague ideas of building aircraft in order to lead the world, or because aircraft are vital to the export drive.

We must build aircraft designed with utmost skill to serve specific sections of the market. If we succeed in doing so, well and good. The aircraft industry will have contributed to the export drive and national prestige will be raised, though the idea of world leadership by a nation of 40-50 million people in so broad a sphere as civil aviation today seems obsolete and wildly unpractical.

We must set our sights reasonably but not hopelessly high. Let us aim at a specific share of the civil aircraft market, a share proportionate to the design, test and production resources of the industry and the ability of the nation to provide initial financial support when needed.

Let us avoid the temptation to fling ourselves into headlong competition with the American industry whenever the West Coast factories announce a new project. If we cannot afford to equip British airlines with British equipment for every conceivable purpose let us admit the fact honestly. The operation of airliners is essentially a more costly, more significant and more productive activity than the design and construction of airliners, and it is therefore false economy and false logic to allow the tail of national prestige to wag the dog of public transport.

Britain's future share of the market depends, above all, on a more realistic and more rational appraisal of the needs of world air transport than in the past. That we have been slow to appreciate those needs is understandable, because our own production of air transport is on a small scale and because the requirements of airlines abroad are not necessarily those of B.O.A.C. or B.E.A.

How much attention have we devoted, for example, to the views of the Commonwealth operators? How many of the industry's policy-makers have forsaken boardrooms, luncheon-tables and drawing boards to feel the pulse of air transport—not merely on the Silver Wing to Paris but on the bush strips, at the bustling North American terminals, in the cockpits of airliners feeling their way home by radio on dark, wet nights . . . ? How many British companies have admitted the full importance of sales, market research and public relations as essential, integrated functions at the highest level of manufacturing activity?

There is no future in building the best aeroplane in its class and keeping the news to one's self, and it is equally futile to build a splendid machine which nobody wants. All this is obvious, perhaps—and yet the disappointments of the past ten years show otherwise.

Despite those disappointments, the potential market for British aircraft is a large one, though, iceberg-like, its full scope is not superficially apparent. The relatively undeveloped areas, in particular, should prove a vast untapped market for British aircraft, provided we direct the maximum possible effort to producing aeroplanes capable of bringing cheaper air transport to as many people as possible. Rivalry between airlines is only one of the factors to be considered in designing a competitive aeroplane: no less important, though less publicized, is the ability to compete economically with surface transport and to overcome natural obstacles at a price which the traveller can afford.

NATIONAL AVIATION MUSEUM—AN URGENT NEED

IT was disclosed last week that Col. A. L. Haley, U.S. Assistant Air Attaché in London, has informed the S.B.A.C. of arrangements to form a museum of historic aircraft in America, and has been making enquiries about British, French and German aircraft of World War I which might be purchased as exhibits. This news, with its implication that veteran aircraft may sooner or later literally go west, has prompted these notes, from a correspondent, on the present outlook for a British enterprise.

FROM time to time the question of forming a national museum of aviation in this country is discussed. Various suggestions are put forward, some more optimistic than others in their scope; but, great and small, they all ultimately founder on the rock of finance. The money for such a museum is very considerable and no one yet has solved the problem of how it should be raised.

Now we hear that the United States plans to form just such a museum. It is likely that the U.S. Air Force may have a big hand in providing funds, since a museum of that kind must have an important bearing on the education and morale of the younger members of the Service. In this country it is known that the Royal Air Force is sufficiently sympathetic to the formation of an aviation museum to consider whether or not some part of the accommodation at Hendon could be made available to house it. This location would be particularly appropriate in view of Hendon's past association with the very earliest days of flying and also because of its proximity to London. There is also—so far—the aerodrome still available.

The fact remains, however, that in this country there is at present practically no museum where the history of the development of aviation is depicted in any reasonable degree of completeness. There are items and aeroplanes of great historical interest in the various museums, and the Royal Aeronautical Society are now the owners of the excellent Nash Collection which they bought in December 1953, but for which there is still no suitable location in which it can be seen by the public.

Perhaps the most interesting and active aviation museum in this country, if not in the world, is the Shuttleworth Collection, which is situated on its own aerodrome at Old Warden, near Biggleswade in Bedfordshire. Veteran aeroplanes from this collection are often seen by the public at the various aviation meetings during the year, and the lively flights by the World War 1 Bristol Fighter and Sopwith Pup or the gentle hops by the very early Blériot monoplane are among the most popular "turns" at every event in which they appear.

The Shuttleworth Collection, with its six real veterans of pre-1918 vintage and a number of others nearly as old, all in full flying order, is now so extensive that A. Cdre. A. H. Wheeler (the Collection's trustee in charge of this activity) is considering the possibility of having occasional "open days" during the summer week-ends. All these exceedingly interesting museum-pieces would be seen and displayed in surroundings very much in keeping with those in which the same aeroplanes used to operate in the hands of the early pioneers who made them. The Shuttleworth Collection is particularly fortunate in having its own aerodrome which provides just such a setting without anachronistic modern runways, control buildings and all the other facilities which are now essential on modern airfields.

But the need for a national museum of aviation remains a very real one. It may take time to find a suitable location and to provide the necessary funds to start and endow such a venture, but at least it should be possible to collect into one place all the various bits of aeronautical history which are now scattered around the country.

CANADIAN EXPANSION

OFFICIALS of Canadair, Ltd., who attended the international meeting of the Canadian Aeronautical Institute and the Institute of the Aeronautical Sciences said that their company's newly expanded test and development facilities would be formally opened on December 1st. W. K. Ebel, vice-president in charge of engineering, said that the expansion programme had now reached a point where the facilities were ready for official inspection by Government representatives. Among other things they would be shown guided missiles and the mock-up of the CL-28 maritime-reconnaissance version of the Britannia.

Arabian Weight-Lifter

A Week's Hard Work by a Blackburn Universal

Scene of the Universal's desert airlift: the 365-mile air journey from Umm Said to Fahud, which took two hours, compared with the alternative 1,050-mile sea-land operation.

AT the urgent request of the Iraq Petroleum Company a Blackburn Universal Freighter flew to the Arabian oil port of Umm Said earlier this month (as reported in *Flight* of November 11th) to undertake the airlifting of 129 tons of bulky oil equipment to Fahud, 365 miles away. Geological surveys had shown Fahud to be a promising site for oil exploration, but the only practical access by land is a rough, 350-mile desert track from Ras Duqm on the south coast which would have first required a 900-mile sea journey from Umm Said. This operation would have involved the manhandling of equipment on to the beach from landing craft, there being no deep water harbour at Ras Duqm.

It could have been possible to reach Fahud by the northern route; this entails a difficult desert crossing which might have been attempted but for the fact that the route passes the Buraimi Oasis, which is the subject of disagreement between Saudi Arabia and the British Government.

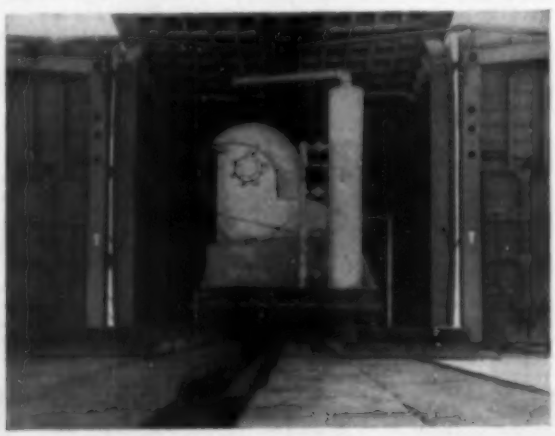
The Universal was operated jointly by Hunting-Clan Air Transport and Blackburn and General Aircraft. G/C. R. C. Hockey, D.S.O., D.F.C., of Blackburns, was in command. Capt. L. B. Greensted, M.B.E., captained the aircraft and headed the 12 strong Hunting-Clan team. The maker's representatives included Blackburn test pilot Mr. R. J. Chandler and there were observers from Bristol and de Havilland.

The air distance between Umm Said and Fahud is 365 miles —just over two hour's flying. As can be seen from the photographs, the equipment moved included oil-pipe lifting machinery weighing 16½ tons, Paxman diesel engines weighing 7½ tons, and other weighty specialist oil equipment such as a draw-works transmitter unit, a rotary table, a travelling block and a mud tank. The official description of the latter is "the tank used to hold the special liquids (mud) used to cool the drill."

In nine flights between November 4th and 14th the Universal completed its task, having lifted a total of 129 tons, and with only minor maintenance. The heaviest lift was on the last day, when draw-works equipment weighing 16½ tons and measuring 21½ft by 9ft by 8½ft was carried.

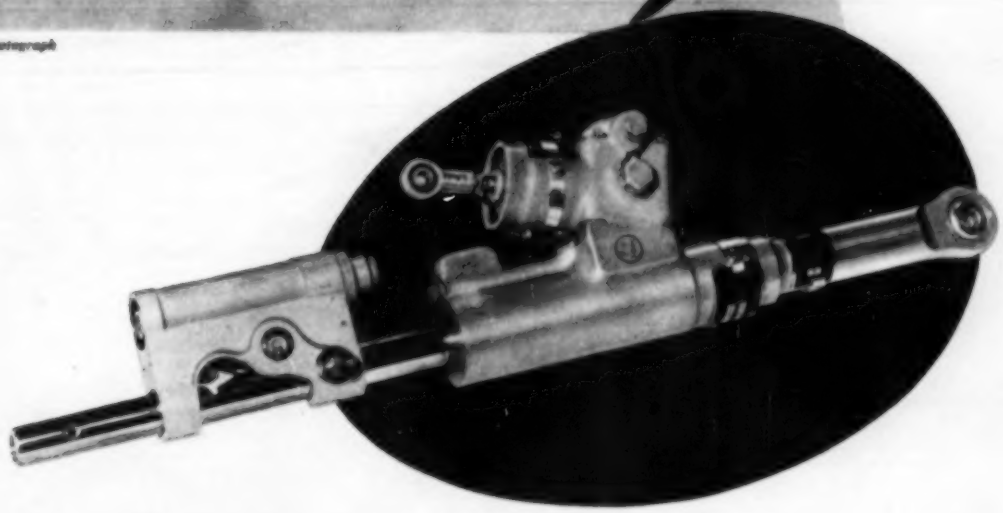
The operation was the Universal's first opportunity to demonstrate its hefty freighting capabilities, and it is a stimulating thought that such tasks will be undertaken as a matter of course when military Beverleys enter service with Transport Command in the very near future. There is no doubt about the military significance of such haulage work, and we recall the words spoken two weeks ago by Marshal of the Royal Air Force Sir John Slessor: "We have got to have a highly mobile reserve of land forces ready to move from A to B with their bulky equipment as quickly as possible, which in my belief is another way of saying 'Beverley'."

A 7½-ton 8½ft-high diesel engine comfortably stowed aboard the Universal before departure for Fahud. (Right) A mere 12 tons of oil-pipe handling gear goes aboard. The biggest single load carried weighed 16½ tons.



"*FLIGHT*" Photograph

flying to fine limits



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North-West Australia's Pioneer Airline

The Story of MacRobertson-Miller Aviation

A recent photograph of Capt. H. C. Miller, co-founder of M.M.A.

By DENNIS M. POWELL, F.R.G.S.

THOUGH the MacRobertson-Miller Aviation Co. was founded in 1928 its story began some years before that. The present managing-director, Captain H. C. Miller, learned to fly in England in 1914; and after the First World War he returned to Australia to barnstorm the country in war-time aircraft. Miller gained a reputation as a very experienced pilot and in 1928 he interested the late Sir MacPherson Robertson, one of Australia's leading businessmen, in the formation of an airline.

Capt. Miller asked de Havilland to construct an aircraft to his own specifications. This was the D.H.61, the first truly commercial aircraft to be flown in Australia. It was a six-passenger cabin biplane powered by a single Bristol Jupiter Series XF engine. The D.H.61 operated a network of services throughout South Australia; then, as business increased, a Fokker Universal was imported from the United States. This was the last American-built aircraft allowed into Australia until the Department of Civil Aviation lifted its foreign aircraft embargo in 1936 to permit the import of the DC-2. (Australia recognized the efficiency of American transport aircraft when a DC-2 came second in the England to Australia Air Race in October 1934. The race had originated through the generosity of Sir MacPherson Robertson, and the outcome clearly showed the great influence which both Capt. Miller and Sir MacPherson had on the early days of commercial aviation in Australia.)

Early in 1934, M.M.A. decided to concentrate its activities in Western Australia, where it obtained the contract to operate the North-West coastal run, actually the oldest airline route in Australia. In November 1921, the now non-existent Western Australian Airways operated an airmail and passenger service between Geraldtown and Derby, only a few months before Qantas started operations in Queensland.

M.M.A. started its North-West service with five D.H.84 Dragons, taking four days to fly from Perth to Daly Waters in the Northern Territory. In 1938, two D.H.86s were acquired, cutting the flying time to Daly Waters to two days.

In the following year M.M.A. started connecting services with Qantas, K.L.M. and Imperial Airways at Darwin. Two Lockheed Electras were then added to the fleet and four Electras subsequently formed the backbone of the fleet until the first DC-3 was acquired at the end of 1945. M.M.A. now has four DC-3 passenger aircraft and one DC-3 freighter, but it was not until the beginning of 1954 that the last Electra (VH-MMD) was retired.

Another type of aircraft obtained after the war was the ex-R.A.A.F. Anson. Five specially modified Ansons are at present in service. They are fitted with seven seats and are used mainly on feeder routes and on the famous Royal Flying Doctor Service.

The directors of the MacRobertson-Miller Aviation Co. Pty. Ltd., of Perth in Western Australia, agree that the introduction of DC-3s into the company's fleet after the end of the Second World War has been one of the major factors contributing to the expansion of the company's services. Since the introduction of its first DC-3 (aptly registered VH-MMA) in November 1945, there has been a continuous expansion in passenger and freight operations, which, in turn, has enabled the company to purchase more DC-3s; a total of five are currently operated. But to return to the historical record: after the First World War (during which he flew with No. 3 Squadron, R.F.C.) Capt. Miller returned to Australia and formed the Commercial Aviation Company, using modified Service-type aircraft. The company registered Australia's first civil airfield with the Government in the State of Victoria, and the first eight years of its existence were devoted to joy riding and charter flights.

In 1927, Sir MacPherson Robertson joined forces with Capt. Miller and they registered a new company, the MacRobertson-Miller Aviation Co. Pty. Ltd., which title has been retained down through the years. Early in 1934, they started operating in Western Australia when the Commonwealth Government accepted a tender from them for the right to operate the air service along the north-west coast of Australia. From 1934 to 1939, M.M.A continued progressively to expand as more aircraft—of the types already mentioned—were obtained. In the four years up to the start of the war, the number of passengers carried each year trebled, with the mail and freight carried approximately doubled.

When the war broke out, Australian coastal shipping almost ceased and the people of the isolated north-west regions had to rely almost entirely on air transport as there were no railway or public road services. Operating unarmed in regions subject to enemy aerial attack, M.M.A. pilots did a magnificent job maintaining the only contact these isolated people had with civilization.

During the war, the R.A.A.F. impressed several of the company's aircraft, and at one stage they were left with only one machine to operate a very thin skeleton schedule.

In 1945, the directors of M.M.A. decided to introduce the DC-3. They actually hired their first from the Commonwealth Government in November 1945 and made do with it until they were able to obtain another from the Americans in Manila in April 1946. Others were bought at intervals from the R.A.A.F., the Zinc Corporation at Broken Hill, and finally from the Pakistan Air Force.

The aircraft have all been modified and converted in M.M.A.'s workshops at Perth to meet the requirements of the Australian Department of Civil Aviation and local operating conditions. Powered by Pratt and Whitney R1830-S1C3G engines, they are fitted with 28 seats (in seven rows of four) and, because M.M.A. often uses its passenger aircraft for freight work, double cargo-type doors. Empty weight varies from 17,691 lb to 17,983 lb and the maximum permissible weight for passenger aircraft is 26,200 lb. Crew comprises captain, first officer and hostess.

All aircraft are subject to a rigidly enforced maintenance programme with daily inspections. A certificate of safety inspection is signed every 40 hr and airframe inspections are made at 125, 500, 1,000, 2,000 and 4,000 hr. After 8,500 hr, each aircraft undergoes a major overhaul. Engine changes are at every 1,050 hr; the time taken by M.M.A. engineers for a double engine change is usually four hours. Yearly utilization of each DC-3 averages about 3,000 hr; for each Anson it is about 1,000 hr.

Particular attention has to be paid to the dangers of corrosion, which is always a possibility in aircraft operating in the salty atmosphere of a coastal route. This problem is overcome to a large extent by keeping a high polish on the skin. The cleaning staff polish the aircraft on a progressive basis. Each time an

The company's Fokker Universal, used on the Darwin-Perth routes from 1935 to 1939. M.M.A. had only one of this type.

(Left) The MacRobertson - Miller network. The thinner lines are the feeder and connecting services.

(Right) Loading beef from a conveyor on to an M.M.A. freighter at Glenroy. The pilot is Capt. Jack Murray, i/c flying operations Air Beef Pty. Ltd.

NORTH-WEST AUSTRALIA'S PIONEER AIRLINE...

aircraft comes into the hangar, the cleaners continue from where they left off when they were last on the job.

Flying conditions along the north-west coast of Australia are generally very good; in fact, tests taken with a gust recorder installed in M.M.A. aircraft on behalf of the Department of Civil Aviation revealed that the coastal route was one of the smoothest flying areas in the world, particularly at night. However, during the cyclone season from December to April, pilots have to take particular care. They always have advance information on the path of a cyclone and normally have ample time to take evasive action. The main danger is in getting caught on the ground and having their aircraft severely damaged.

Under normal conditions, the DC-3s cruise at 165 m.p.h. at heights varying from 2,500 to 10,000 ft, depending on the winds encountered. Navigational equipment includes radio compass, V.A.R., D.M.E., drift recorders for the longer flights, and V.H.F. and normal H.F. two-way communications.

Another modification undertaken by M.M.A. engineers to increase safety margins is modification of the hydraulic system to provide double speed retraction of the undercarriage during take-off.

The DC-3s are called upon to carry out many duties but their main purpose is to operate a passenger and freight service between Perth and Darwin, a distance of 2,028 miles. The longest hop regularly flown is 445 miles from Carnarvon to Port Hedland but the aircraft are also used on what are known in Australia as "station flights," serving a number of cattle stations. For example, in the far north of Western Australia where the population is very small, one DC-3 and the Ansons operate a "station service" in the Kimberley district which involves flying a total of 1,882 miles with 23 stops. (The flights between some stations are as little as 18 miles.)

On occasions, M.M.A. has operated its DC-3s outside Australia on charter. The longest such flight was to Calcutta to bring the Indian cricket team and officials to Australia, while several flights have been made to Koepang in Timor to bring native divers for the pearling grounds at Broome.

Over recent years, the company has paid increasing attention to air freight. There are no railway or road services in the north of Western Australia, but only a shipping service operating up and down the coast. Consequently the residents rely heavily on M.M.A. for the carriage of urgently required goods.

In 1934, the first complete year of operations in Western Australia, M.M.A. carried 21,184 lb of freight. This increased to 65,553 lb in the year before the war, and by 1953 the total had risen to 2,220,000 lb. Since then, there has been a very sharp increase in the demand for air freight and the total carried during 1954 was 5,840,000 lb.

A feature of M.M.A.'s freight service is their own "Air Beef" operation in the Kimberley district—an industry that has aroused world wide interest among cattle raisers. Towards the end of 1948, M.M.A., Australian National Airways and a group of pastoralists in the Kimberley district contributed capital for the formation of Air Beef Pty. Ltd., and an inland killing centre was established at Glenroy station, an area inaccessible to road transport. Cattle are slaughtered at this abattoir and the carcases are then flown 185 miles to Wyndham, where they are put in the freezers of the Government-owned meatworks to await shipment overseas.

Air Beef really proved its worth in 1952 when the Kimberleys were struck by a disastrous drought. The kill at the Wyndham meatworks fell off by some 40 per cent, but the inland abattoir was unable to cope with the demand to slaughter cattle which could not be driven to the coast because of the drought. The kill in that season reached 5,186 head and the area around the Air Beef abattoir was the only part of Northern Australia to increase production during the drought.

An essential part of the Air Beef scheme is the backloading in the freighter of stores, fencing wire, machinery and other requirements for Glenroy and several nearby stations. In this way, the scheme is made economically practicable.

It was the growing demand for air freight and the Air Beef venture that prompted M.M.A. to buy a C-47B from the Pakistan Air Force at the beginning of 1954. Its auxiliary fuel tanks, heating system, glider tow gear and autopilot were removed; cockpit/cabin bulkhead moved forward; bonded-wood floor installed; toilet compartment eliminated; undercarriage strengthened; and taper-blade airscrews and special lightweight tailpipes fitted. This brought the empty weight of the freighter down to 15,100 lb and permitted a maximum payload of just under 10,000 lb.

During the last Air Beef season, the freighter remained in the north for 17 weeks transporting beef from Glenroy to Wyndham. In that time, it made 209 flights, carrying 2,017,829 lb of beef. It was serviced by a ground party at Glenroy working in the open air and throughout the long season.

Another specialized service undertaken by M.M.A. is aerial photography and the necessary equipment has been fitted in the freighter. The aircraft can be converted from freight to photographic work in only 30 min. The latter duty involves the installation of oxygen, heating and inter-communication for the captain, first officer, navigator and cameraman. The camera used is an Eagle 24. The aperture is placed on the right-hand side of the floor between stations 390½ and 411½ while the drift sight is installed at station 94 on the starboard side of the fuselage. Oblique photography is done through the right-hand rear window.

Ways of improving the existing services to the north of Western Australia are constantly exercising the minds of M.M.A. executives. The population in the areas served by the company is somewhat limited, a fact which would make it difficult to operate larger type of aircraft as an economic proposition. The main advantage of newer equipment would be the provision of a faster service over the long route.

This article may fittingly conclude with some brief statistics: M.M.A. has an unduplicated route mileage of 13,475 miles; its aircraft fly 31,000 miles a week. In 1954 it carried 28,143 paying passengers (the population of the area served, excluding Perth, is about 20,000). In the same year M.M.A. carried 6,000,000 lb of freight, which represents some 300 lb for every person in the area served.

A recent photograph of MacRobertson-Miller Aviation's fleet of five DC-3s outside the company's hangars at Perth.

TWIN PIONEER in the Air

NO. 53 OF THE SERIES

By THE EDITOR

FAIR, unbiased, impartial as a pilot may try to be, and with all the best intentions, he cannot, I think, approach any new aircraft with a completely open mind. I can well remember the machines which I looked forward to flying, others which came along as a job of work, no more and no less; and there have been a few, too, which I kept away from as long as reasonably possible. The Twin Pioneer had interested me from the start, and I was anxious to try it in the air. I didn't expect it to go from A to B like a Hunter, manœuvre like a Gnat, or progress majestically like a Britannia; it appealed as a eminently practical and sensible load-carrying aircraft with an intriguing up-and-down performance.

Remarkably, the Twin Pioneer has managed to find a unique position in the range of transport aircraft. Scottish Aviation, of Prestwick, its makers, claim with justification that it offers real competition to the transport helicopter or, more correctly, to what the medium transport helicopter may be when some exist.

Visitors to Farnborough this September saw the machine make its first public demonstrations. The take-off and climb can be described, in the complimentary sense, as staggering. Here is a sixteen-passenger, twin-engined feederliner which will unstick from 85 yd of concrete, and land back on in about 60 yd. The take-off figure quoted is one of the first to be measured during the current series of tests, and it betters the earlier estimated figure by 8 yd, even though the particular Leonides engines each had some 20 h.p. in hand on their take-off rating. This was at an all-up weight of 13,500 lb.

Perhaps few spectators realized that the Pioneer's startling demonstrations at the S.B.A.C. Show were given after only about a dozen hours of flying. Good for publicity, but bad for progress in testing; unproductive hours totalled more than 40 before testing proper commenced recently. Some three weeks have been spent on the ground to enable an automatic observer with unusually complete instrumentation to be installed. The aircraft as flown was also tufted, probed and *sans* gills. Seats had been removed, but cabin trimmings are in place.

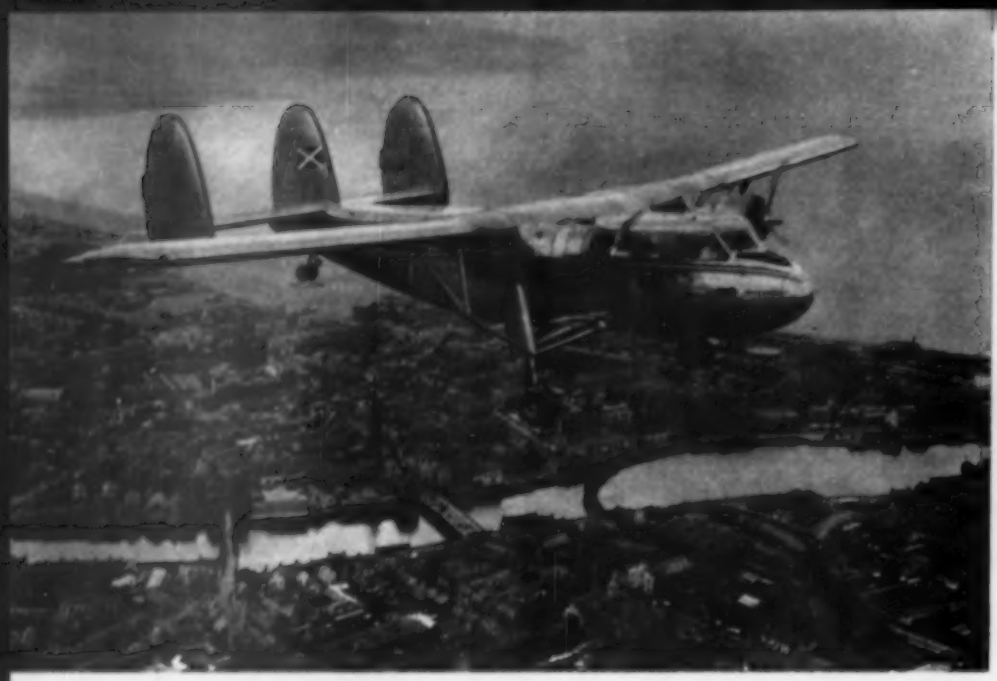
It occurred to me as I looked over the Twin Pioneer that here is the first modern, all-metal machine which can take over from the Rapide and, in keeping with technical advances, greatly improve upon the multifarious abilities of that versatile aeroplane. All over the world, anything the Rapide could do it can do better. While the Pioneer challenges the helicopter in many classes of work, the helicopter does not challenge the Pioneer. No commercial helicopter exists that can carry 16 passengers for 500 miles at about Dakota speed of 140/150 m.p.h. When, soon, it does, will it be extremely simple to maintain and fly, and will its operating costs be 1.6d (one-point-six pence) per passenger mile? And how will purchase prices compare?

Some interesting figures can be worked out for Twin Pioneer services over the most competitive European routes, taking advantage of the very short runway requirements. With the use of a strip the size of a football field in, say Regent's Park, London (or perhaps a small escort carrier taken over and moored below Tower Bridge) the time to Paris, as compared with present first-class services, could be cut by as much as 1½ hr and the fare could be considerably reduced. (A definite proposal has been made based on Wormwood Scrubs, near Shepherds Bush, in West London—the scene of some very early aviation activities.) These thoughts are included to indicate one of the possibilities of operations with short-take-off aircraft to which the Duke of Edinburgh indirectly referred during a recent speech to the Guild of Air Pilots and Air Navigators (and in the presence of the Lord Mayor of London).

It would be short-sighted not to admit that many overseas customers who are showing an interest in the Twin Pioneer have asked about American engines. In particular, everyone seems to have a source of cheap Pratt and Whitney units and, certainly, many operators are equipped to deal with Wasps, while the spares are to be found in almost every country. The R-1340 is now being produced again—in Canada.

Scottish Aviation are not at all inclined to change from the

Photographed at Prestwick last week, the Twin Pioneer is seen now to be equipped with a probe. The wing is also tufted. The stocky proportions and large cabin door are well portrayed.



Bonny Twin (otherwise double scotch) over Ayr. Safe and economical transport from short landing strips is to be offered for 16 passengers.

TWIN PIONEER in the Air . . .

Alvis Leonides, which has proved smooth and reliable. The overhaul period of the Leonides is about to go up to 800 hr, and can be expected to be higher still when the Twin Pioneer goes into service. The geared Wasp's installed diameter is several inches greater and the weight difference for the two units would be equivalent to three passengers. The output of 600 b.h.p. is higher than the 540 b.h.p. of the Leonides, but it may be significant that Alvis helicopter units of the same design give 570 b.h.p. The P. and W. unit, also economical and very dependable, gives higher percentages of its take-off power for continuous and cruising use.

The Leonides engines are set well apart in the Pioneer, and the D.H. airscrews have large, Herald-type blades.

Little requires to be said of the Twin Pioneer's external features. The aircraft is still very new, but its short, spacious fuselage, high-wing, three-fin layout is already quite familiar. Twin mainwheels are fitted to the fixed legs each side and large-area Fowler flaps are employed. Bigger-section tyres might be desirable for operation from soft strips.

Having in mind the mixed transport requirements of remote places overseas, a large entry door has been provided. The aircrew sit side-by-side in the wide, blunt nose, and dual controls are offered for operators who want them.

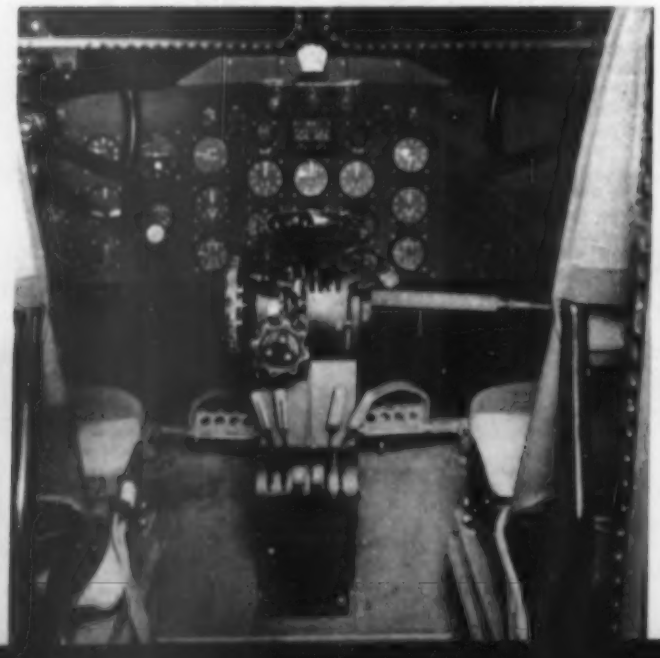
It is hard to give a word picture of a cockpit and instrument layout; one needs to see it or at least to examine a picture—one is provided here. The comparatively few essential instruments are neatly arranged on a large, plain panel, and the controls are grouped on a central pedestal. Starting panel (cartridge starters are used), electrics and radio are in the roof.

From his seat, which has no adjustment, the pilot sees out well, though not rearwards or overhead. The screen panels are large and uninterrupted and the side windows slide open. With some advantage the outside corners of the screens could be dropped by 2 or 3in, to give a closer view of the runway when tail down. This might give some slight datum, also, by exposing a section of the nose to view. At present, the pilot can see nothing upon which to "line up." It would, of course, be simple enough to provide a bead on the nose.

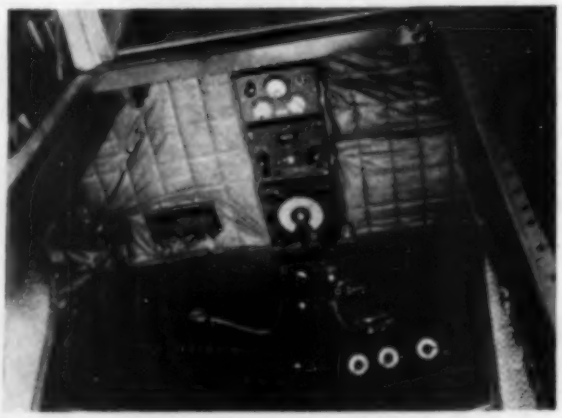
During the course of an afternoon at Prestwick—crisp and bright as nearby Glasgow was dull and smoggy—I made some half-dozen take-offs and landings, with Mr. N. J. Capper, chief test pilot, whistling with tactful nonchalance in the other seat. It is no mean responsibility to thud someone else's prototype on to the runway for the first few times, and a gentle cross-wind didn't help my rather rusty judgment.

Having adjusted my pedal reach with the aid of a large star-wheel on the rudder pivot, and my height with a cushion, I was invited to line up and take-off, Mr. Capper having previously demonstrated the circuit procedure.

No handling notes have been prepared as yet, and exact



(Left) A simple instrument layout with group controls on a single pedestal. Dual control would normally be provided. (Below) In the roof are the radio, electrics and starting panel.



The Alvis Leonides Major gives the Whirlwind enhanced load lifting and hovering ability and increases the height attainable in forward flight.

ALVIS LEONIDES MAJOR

ALVIS LIMITED COVENTRY ENGLAND

SAUNDERS-ROE SKEETER Mk 6 *for service with the Royal Air Force . . .*

Powered by a de Havilland Gipsy Major 200 engine, the Saunders-Roe Skeeter Mk 6 is a most economical helicopter to operate and is ideal for the training role.

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techniques and speeds are being worked out. From memory, the nose trimmers are all set within a degree of neutral; pitch full fine, of course; flaps at the take-off gate, and controls unlocked. A safety catch holds the throttles back as long as the controls remain locked. Our weight, with four bods, instrumentation, ballast and full tanks, was 13,300 lb.

The powerful toe brakes easily hold the machine while the throttles are opened and as they are released the little transport surges forward, the two Leonides sounding like runaway sewing machines. Things happen quickly and there is insufficient time to feel any great surge of power. You ease the wheel forward with a firm push and the tail comes up straight away. After a count of about five the A.S.I. shows 50kt and it is time to pull back on the wheel again. No sooner has this been done than the aircraft is off the ground, with speed building up quickly between 60 and 70kt. There is no "lift going up" feeling, yet the ground recedes remarkably quickly and the whole length of the runway still seems to be ahead at 500ft. I did not detect any tendency to swing and only the smallest use of the powerful rudder was required to keep straight.

A happy, not too hectic climb angle is maintained at about 75kt, although the climb rate is probably a little higher at 65kt. As soon as we were established in the climb—and this meant pulling back on the wheel—the flaps were brought in with accompanying trim change, and the engine levers eased back to 2,900 r.p.m. at +3 lb boost. The climb needle continued to indicate not far short of 1,000ft/min.

We climbed on to 2,000ft and turned north. As would be expected on a machine of the type, the controls are rather "commercial," by which I mean a little heavier and more sluggish than those on a smaller, faster aircraft. They are, however, very adequate, and of the non-tiring variety for route flying. The aircraft will turn quite accurately on rudder or bank separately, but for quick going in or coming out and for steeper turns, both are required—particularly in the recovery to straight and level. The weight of the elevators seems to remain more or less constant from climb speed of about 70kt to economical cruise of 120kt. Some detail work is to be done on the ailerons—which are, however, adequate and effective.

The stall is rather a joke. With take-off flap and no power, the Pioneer gets slower and slower and slower. Finally, with wheel on the back stop, it gives a slight shrug as if to say "Since you insist," and then gently bows in submission, with wings level, and continues in its glide with the nose a few degrees lower. The speed is just over 45kt, and the loss of height when recovering is negligible. Stalls with flaps up or fully down are similar, but occur a few knots higher or lower. No warning is really necessary, though I can imagine that more indication of impending stall may be requested.

Single-engine performance is remarkable. The aircraft, without feathering, continues on either engine alone at about 75-80kt; the best speed has yet to be determined. The climb on one, feathered and at full load, is low but positive. But the surprising feature is the single-engine safety speed. If one motor is cut on the climb at a little under 60kt, the aircraft can be held straight on the rudder and the foot load is quite acceptable without immediate trimming.

For a short time while we were cruising in the vicinity of Ayr I walked back into the cabin to see and hear as, later, passengers will do. The noise level is surprisingly low and the view from the windows is very good. Something about the cabin proportions and the wide umbrella of a wing above gives a definite feeling of security. Perhaps extra confidence is given by the knowledge in the back of one's mind that the aircraft could "parachute" down almost vertically in an emergency with, at worst, a graunched landing gear as a result.

Back at the controls I set about making an approach. The pattern is very flexible and can be varied to suit runway terrain and other traffic. On the first occasion, we made a long rumble in behind a DC-3. Flap-down speed is 80kt and suitable power was provided at about −3 lb boost, in fine pitch. Most of the approach was made at 70kt, slowing down to 60kt over the boundary. There is little by which to judge one's attitude, and first time I still had the tail a foot or so up when the main wheels touched. The Twin Pioneer attempted half-heartedly to bounce but immediately settled back on

Passengers will have a good view from the Twin Pioneer cabin, although here the starboard engine and struttery have intentionally been included.

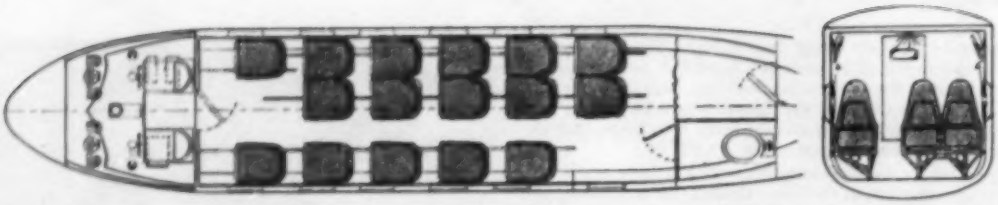
three points and then came to a standstill in no more than 100 yd.

After this we did one or two touch-and-go circuits, and I noted that on the down-wind leg the speed was 100kt with −2 lb boost and 2,200 r.p.m.

On the next approach, flying from the left hand seat, I turned in too high and so made a steep approach. With full flap and a mere trickle of power, the machine sang in sweetly under full control at 60kt, and the over-boundary speed dropped to 56kt. This time a touch of throttle and a slightly firmer hold-off produced a good three-pointer with a definite feel of putting her down on the spot, as opposed to holding-off till she dropped. This landing run could not have been much over 75 yd. A glide approach can be tackled with the same ease.

The final two circuits were done with an increasing wind from port of the runway. In spite of the slab sides and the

A pleasing aspect of both the aircraft and the Leonides engine. Note the large airscrew blades, leading-edge slots, the twin main wheels and sizeable windows for pilot and cabin.



Seating layout for 16 passengers and two crew. In the standard aircraft the cabin is 19ft long and gives 5ft 8in headroom throughout its length.

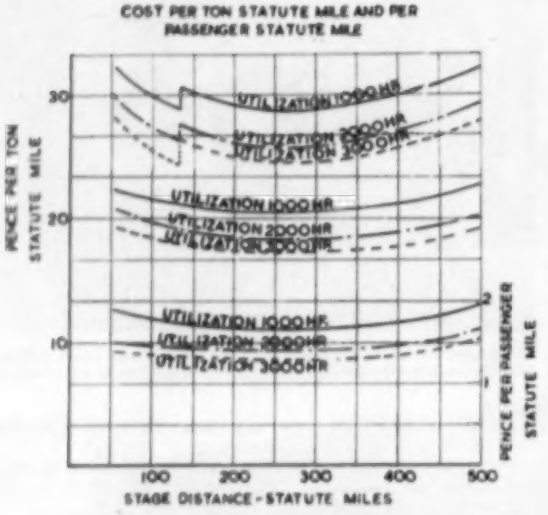
TWIN PIONEER in the Air . . .

three sizeable fins, a cross-wind seems to have little effect. On one take-off we held the nose down for a second or two and then pulled up, achieving an alarming climb angle without any apparent risk or effort. On a particularly slow final approach it was also clear that aileron control remains right down to the stall.

The flight finished when we taxied in—a manœuvre which is made simple by the good view, wide-apart main legs, smooth toe-brakes and responsive engines.

Early as it is, plans are well in hand for production of the Twin Pioneer. More machines are close behind the prototype and, in addition to the few orders accepted, others are awaiting establishment of dates and priorities. A batch of 100 is in hand. Capacity exists for the eventual production of up to ten aircraft per week, and a new drawing-office is soon to be established.

And yet the versatile and economical Twin Pioneer has scarcely started to be appreciated. It is in a class of its own: one with world-wide appeal. It is capable, without great capital outlay, of bringing the advantages of air transport to countries and islands which have not previously seen machines larger than the Rapide and Auster.



Cost curves for operations in and outside the United Kingdom. The upper three curves for 1,000, 2,000 and 3,000 hr utilization take into account the extra cost of U.K. petrol tax and landing fees.

SCOTTISH AVIATION TWIN PIONEER
(Two Alvis Leonides 503/8)

Length	45ft 3in
Span	76ft 6in
Height (tail down)	12ft 3in
Wing area (including ailerons)	670 sq ft
Wing mean thickness/chord ratio	15 per cent
Empty weight (16-passenger aircraft)	9,075 lb
Payload	3,008 lb
Disposable load	4,425 lb
Average laden weight (16-passenger aircraft)	13,500 lb
Estimated performance at 13,500 lb:—	
Max. weak mixture cruising speed	159 m.p.h. at 11,000 ft
Cruising speed at 5,000ft (40 per cent take-off power)	124 m.p.h.
Cruising speed at 5,000ft (50 per cent take-off power)	139 m.p.h.
Stalling speed (flaps up, engine off)	67.5 m.p.h.
Stalling speed (flaps 32½ deg, engine off)	47.5 m.p.h.
Max. still air range (124 m.p.h., 5,000ft, full tanks)	620 miles
Rate of climb at sea level	880ft/min
Take-off distance to 50ft (grass)	357 yd
Landing distance from 50ft	294 yd
Minimum distance to unstick (concrete)	85 yd

TRANSONIC DESIGN — M.o.S. STATEMENT

THERE can now be very few readers of *Flight* who have not acquired a basic knowledge of the area rule for transonic design. The rule was introduced in our issue of September 30th last and was amplified, from a British viewpoint, in an article contributed by Mr. W. T. Lord, a Farnborough aerodynamicist, and published last week.

The following is part of a statement (entitled *Contributions to the Shape of Transonic Aircraft by the Royal Aircraft Establishment*) issued by the Ministry of Supply; the remainder of the statement is taken from Mr. Lord's article referred to above. The statement is the first to discuss recent British aircraft by name.

"The major credit for the area rule must undoubtedly go to the Americans for their experimental investigations, but quite significant original contributions to its development have been made in Britain (and also in Sweden and in France). The area rule is not, moreover, the only method of improving the performance of aircraft at transonic speeds.

"Apart from the area rule, a completely independent approach by D. Küchemann, a German scientist working at R.A.E., had built up a theory of fairing design several years previously which gave much the same clues to desirable aircraft shapes as the area rule. In its present extended form, developed in collaboration with D. E. Hartley, it results in improvements of the transonic and supersonic performance which are equivalent to those obtained by the area rule. More work is in progress to achieve a better understanding of transonic flow, and there are indications that the two methods are complementary.

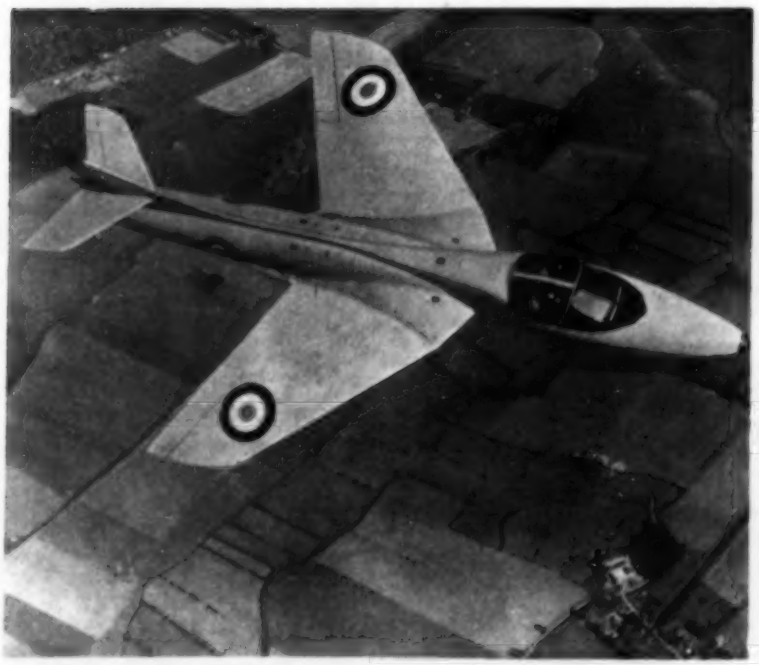
"So far, there are only a few aircraft which show direct application of the area rule. But the second method has influenced a number of current aircraft, especially in this country but also in the U.S.A. (for example, the Douglas F4D Skyray). In Britain the basic layout of the aircraft often differs from that favoured in the U.S.A. For instance, bomber designs in this country preferred a wing-root installation of the engines to mounting in pods. This is beneficial in that use can be made of the possibility of suitably designing the wing root rather than modifying the fuselage only. Therefore, such aircraft do not exhibit exaggerated waistlines. Examples are the Handley Page Victor, the Avro Vulcan and the Vickers Valiant, where an applicatio of the method of Küchemann has resulted in shapes which are not likely to be further improved by an application of the area rule. The Folland Gnat is a case where the two methods have to a large measure been combined. The English Electric P.1 has been developed in full knowledge of the area rule. Several other aircraft show design trends which have been influenced by the second R.A.E. method. These are mostly alternatives to fuselage waisting. For example, such influences are apparent in the intake design of the Hawker Hunter and Gloster Javelin; in the curved wing tips of the Hunter; and in the fin/tailplane design of the Victor, the Javelin, the Hunter, and the de Havilland 110."

CANADIAN AIR INDUSTRIES OFFICERS

MR. E. H. MONCRIEFF, president of Standard Aero Engine, Ltd., has succeeded Mr. T. P. Fox, head of Associated Airways, as president of the Canadian Air Industries and Transport Association. Vice-presidents for the coming year are Mr. R. W. Ryan, C.P.A.L.; Mr. J. W. R. Drummond, Canadian Pratt and Whitney Aircraft; Mr. F. T. Wood, T.C.A.; Mr. D. W. Kendall, Photographic Survey. Other directors are Mr. J. A. Austin, Mr. D. Watson, Mr. A. Michaud, Mr. P. C. Garratt, A.V-M. A. L. James and Mr. J. G. Notman.

HUNTER FOR TWO

New Air-to-air Views of Hawker's Elegant Two-seater



IN 1914—that is, some 41 years ago—the First Lord of the Admiralty, Mr. Winston Churchill, was receiving flying instruction on a Sopwith biplane with side-by-side seating. Descended in direct line from this "Sociable" (in the terminology of the day) is the Hunter Two-Seater, portrayed in these new studies by Cyril Peckham.

The Hunter Two-Seater is an ingenious adaptation of the standard single-seat Hunter intercepter; indeed, aft of the intakes for the Rolls-Royce Avon turbo-jet the airframe is identical with that of the F.4. Forward of that point, however, the structure is entirely new. The two seats are Martin-Baker Mk 4 lightweights, and the canopy is a remarkable piece of moulding in plastics, affording a clear field of vision in essential directions. Provision is made for two gun-sights, with radar ranging for the two 30 mm Aden guns, fitted in fairings beneath the cockpit. A camera gun is carried in addition.

Although the new machine has been officially designated by the Ministry of Supply as the Hunter Trainer, the makers prefer to describe it as the Two-Seater because they foresee possible operational developments. Clearly the lengthened nose might well accommodate A.I. radar, and the provision of a second crew-man would permit operation at night or in bad weather.

The influence on performance of the broadened and lengthened forward fuselage was not discernible when the prototype of the new machine, numbered XJ615, made its public debut at the S.B.A.C. Display this year. It will be remarked, in the picture on the left, that the revised fuselage lines give a strong "waisted" effect, conforming, in some degree, to the principles of "area rule."

Little seen in this country nowadays, floatplanes have a fascination all their own. A fine, if elderly, example is the Howard DGA-15P, a recent picture of which appears on the left. The large machine is the "Hi-Per" development of the Douglas DC-3, having Pratt and Whitney R-2000 engines, clamshell undercarriage doors and other refinements which are claimed to raise the cruising speed to well over 200 m.p.h.

AIRCRAFT INTELLIGENCE

U.S.A.

Convair XB-58. The latest reports indicate that this supersonic bomber prototype should make its first flight next autumn at Fort Worth, Texas. The immediate programme, it is said, has been cut from 30 to 13 machines as a result of "anticipated performance difficulties."

Convair TF-102A. This side-by-side combat trainer made its first flight at Edwards A.F.B. recently. After a 30-minute flight R. L. Johnson, Convair's chief engineer and test pilot, reported that it handled just like the F-102A all-weather intercepter.

France

S.E.210 Caravelle. Addressing a group of journalists recently, M. Max Hymans, president of Air France, stated that his company was contemplating the purchase of jet transports. He referred to his recent visit to the Boeing and Douglas plants, but stressed that the particular interest of his company was the Caravelle. This aircraft, he declared, was a remarkable medium-range machine, and his company was thinking of ordering at least twelve of them.

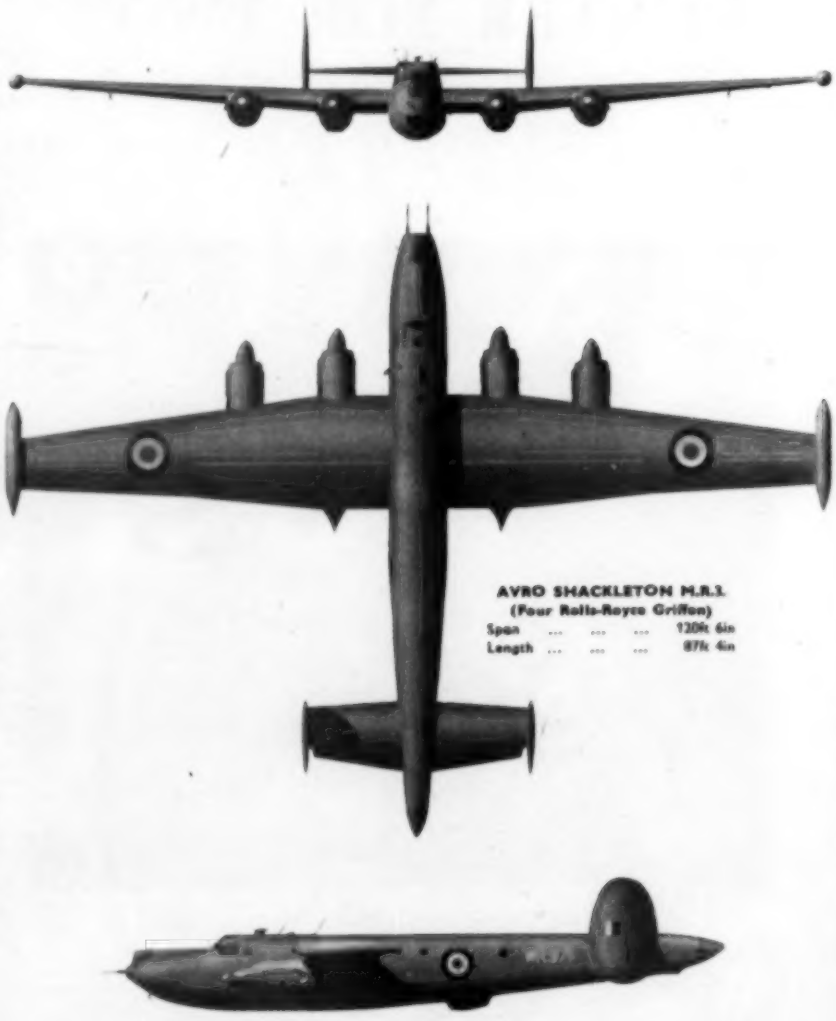
S.O. Djinn. A prototype of the Djinn helicopter recently made an experimental flight at an all-up weight exceeding 1,765 lb. The take-off weight for the first prototype was 1,320 lb and this has subsequently been raised to 1,540 lb and 1,675 lb. The latter figure will be the maximum guaranteed gross weight for the first production models.

Nord 1500 Griffon. Formerly known as the Guepard, the Griffon delta-wing fighter is to have a new type of windscreen developed by the Triplex company. This is described as having a curved profile adapted to the aerodynamic requirements of the airframe and eliminating the usual lateral glass panels, thereby permitting a "perfect view" for landing. A similar screen is to be fitted on the Dassault 550.

Germany

Air Force Planning. It is unofficially reported that for the formation of the new German Air Force, which will consist of 20 air brigades, the Germans will receive a number of F-84Fs and RF-84Fs. A spokesman for the Luftwaffe has said, "We are so close to the communist frontier that we need very fast aircraft, capable of climbing to 18,000 metres in 2 min (or even less) and of reaching Mach 1.8-2. No U.S. aircraft sent for NATO is capable of such performance. Furthermore, the Hunter, which has been mentioned as a possible standard fighter, is not fast enough." Some authorities consider that the new German aircraft industry could alone create a fighter of the type envisaged, though others are for co-operation with the U.S.A.

It is further reported that Northrop representatives have recently been in Germany trying to interest German manufacturers, and the Luftwaffe, in light fighters having a "new delta wing design." (General Galland has also studied the Gnat.)



AVRO SHACKLETON M.R.3.
(Four Rolls-Royce Griffon)

Span	...	...	...	120ft 6in
Length	...	...	...	87ft 4in

DESIGN ASPECTS DISCUSSED

—at R.Ae.S. All-day Meeting: Structural "Fail-safe" Philosophy Questioned

THE lecture theatre of the Institute of Civil Engineers at Storey's Gate, Westminster, was uncomfortably full on Thursday, November 17th, for the so-called "Section lecture and discussion on aircraft design philosophy" organized by the Royal Aeronautical Society. Although seldom lapsing philosophical, the meeting raised a good number of design factors for public airing, and provoked illuminating comments from members of the aircraft industry, research establishments and the Air Registration Board. The all-day deliberations were firmly guided by Sir Arnold Hall as chairman, who pointed out that the theme of the four main aspects to be discussed would be their bearing on aircraft safety.

Flight Loads was the first subject, on which a paper was presented by R. H. Sandifer, assistant chief designer (structures) of Handley Page, Ltd. After tracing the historical development of knowledge in this sphere, Mr. Sandifer based his description of current requirements on illustrations of the basic flight envelope and basic gust envelope, in which the variations of acceleration factor and gust load factor, respectively, were plotted against speed. He compared the requirements for civil and military aircraft in each case, and also in the case of asymmetric manœuvres; and referred to "the debatable question of fitting g-restrictors." Control-surface loads caused by autopiloted flight, and cabin pressure loads, were also described.

Turning to the future effects of flight at higher speeds and accelerations, the lecturer said that the most important factor which would influence flight-load requirements would be the effect of kinetic heating. Temperature gradients would need to be restricted, and V-g recorders (if not g-restrictors) might be demanded. Novel aerodynamic loads might result from such developments as the jet flap while, on the structural side, aeroelastic requirements would need to be restated in view of new wing-forms. Accident investigations had shown that less than five per cent of accidents in the past had been caused by structural weakness—this was a fairly good record but care would be needed in the future.

In the discussion following Mr. Sandifer's paper the need for the severe requirements for negative-g manœuvres in the case of civil aircraft, and for "fishtailing" manœuvres, was questioned. Other points raised in the discussion included the problem of autopilot malfunctioning; the fact that the military aircraft negative-g requirement was based on V-g records; and the question of whether margins used in the past to cover pilot error were now necessary. In reply to a questioner who opposed the increase in stick forces as a means of restricting the accelerations which could be applied by the pilot, the lecturer stated that weight could be saved, particularly on highly manœuvrable aircraft, if g-restrictors were used.

Safety Factors, by Mr. J. K. Williams (head of the structures section, A.R.B.), was the next paper to be presented. In it the lecturer submitted that the whole approach to the specification of safety factors had been based on experience, compromise and judgment. The statistical approach was of no use while design and operating techniques were changing as rapidly as at present. Safety in civil aircraft, he stated, depended on the properties of structures (materials, workmanship, stress analysis and test methods), intensity and frequency of loads (gusts, pilot-induced, cabin pressure and landing), and operational technique (control of speed and altitude).

The trend in the fatigue-strength properties of aluminium alloys, he continued, had been a decrease which had accompanied the improved ultimate tensile strength which had occurred over the last 20 years. Strength tests to destruction were still necessary as a basis for certification. Dealing with design cases, the lecturer referred to the static case, in which the safety factor was expressed in terms of a load ratio (including an analysis of the 1.5 factor); and the fatigue case, in which the safety factor was expressed in terms of a life ratio. After describing past experience and suggesting some future problems, Mr. Williams referred to safety aspects of "fail-safe" structures.

Opening the general discussion, Mr. Bulman (Short Bros. and Harland) enquired how the fail-safe theory was related to the use of integrally constructed wings. Mr. Chichester Miles (Hunting Percival Aircraft) submitted that, if the design philosophy of the 1.5 factor were correct, it should be applied to the stress which produced fatigue failure. Mr. Legg (Short Bros. and Harland) suggested that present stiffness requirements in relation to flutter and to aeroelasticity in general were out of date, and Mr. Raoul Hafner (Bristol Aeroplane Co.) put forward a plea for the abolition of safety factors altogether. These factors were factors of ignorance, Mr. Hafner added, and when failure occurred it was not because the safety factor was wrong but because the design assumptions were wrong: assumptions that were more conservative should be made. Mr. Williams commented that any new design must be shown by test to be safe—either by means of a fatigue test or by fail-safe demonstration.

Fatigue was the first subject considered at the afternoon session, and the main paper on this was presented by Mr. H. Giddings (assistant chief engineer, Bristol Aeroplane Co.). A paper by Lundberg in 1947, he said, had given a very accurate forecast of the position today. The Comet accident in 1954 had shown how slowly fatigue work on wings had been extended: the fact was that no component could be excluded in considering fatigue problems. The speaker dealt in turn with fatigue loading conditions (loads having differing frequencies of application), methods of obtaining fatigue loads (calculation, he said, could be only approximate) and of minimizing loads, and the empirical nature of the problem of fatigue strength.

After referring to fatigue damage ratios for various loads and the cumulative-damage theory, and pointing out that the scatter of test results could be decreased by pre-loading and more complete testing, Mr. Giddings turned to the question of fail-safe design. The critical crack-lengths in cases of fatigue and static failures were compared, and the relationship between mean stress and critical crack-length was studied. In conclusion the lecturer put forward the following programme for guarding against fatigue: (1) analyse the operating conditions of all components; (2) study the S-n data; (3) simplify the design of the structure; (4) by careful design ensure that the rate of crack propagation is not catastrophic; (5) carry out fatigue tests; (6) confirm the results by means of flight tests; (7) use counting accelerometers in flight; and (8) ensure a high standard of maintenance and inspection.

During the discussion on the subject of fatigue, Mr. Giddings emphasized that there was no real conflict between concepts of integral construction and fail-safe design. Concerning possible use of reinforced plastics in place of light alloys, the lecturer said that his company had made tests on this; in some of the tests on reinforced plastics specimens, however, "a number failed as we were putting them in the test machines." He thought that a fail-safe structure could be achieved without any significant weight-penalty.

Turning to the more general aspects of design philosophy, one speaker asked whether sufficient attention was being paid by designers to pilot fatigue: in many accident cases where "pilot error" had been blamed, he suggested that designers should take their share of responsibility. Another questioner wanted to know whether cheaper civil-aircraft operation would be achieved by reverting to the use of materials having a lower ultimate strength but better fatigue properties. The lecturer replied that fatigue-proof aircraft could be built without economic penalty and without going back to low-strength materials.

Structural Strength Testing was the subject of a comprehensive review by Dr. P. B. Walker, head of the structures department, R.A.E., who dealt in turn with static, fatigue and thermo-structural testing. In an earlier paper published in 1949 the lecturer had concluded that major static strength tests were essential to safety. On the basis of ten years' testing experience, some 50 per cent of structures as originally designed had failed to reach the designed standard of strength—although most of these aircraft reached this standard after one or two modifications. This paper had suggested that some designers were deliberately taking the risks in design in order to save weight, secure in the knowledge that ultimate safety was ensured by the final test; and this philosophy of taking risks in initial design was now widely accepted.

The great majority of premature failures, it appeared, were caused either by structural instability or by stress concentrations. It might never be safe to rely entirely on theoretical calculations to reveal all local stress-concentrations or to indicate their magnitude. As fatigue tests were far more effective than static tests in detecting stress concentrations it might be possible to dispense with major static-testing for this purpose, although the likelihood of structural instability was not indicated by fatigue tests.

Concerning the fatigue hazard, there were three main contributors; gusts, cabin pressurization and manœuvres. The two problems facing the designer were to decide what tests were necessary and how the testing should be carried out. Tests of components, and major tests of complete aircraft or large units,

DESIGN ASPECTS DISCUSSED . . .

were both required. Because of scatter, life predictions required the testing of several specimens and, since major tests were extremely costly and could not be repeated as a routine, the main spearhead of the attack on fatigue was through the testing of critical components. The main functions of a major test were to indicate weak places and critical components which would otherwise remain unsuspected, and to enable a study of crack propagation to be made.

With the prospect of supersonic speeds at high Mach numbers, structural testing had to combine mechanical loading with a complex thermal-loading system. The most difficult problem in reproducing appropriate thermal conditions lay in providing a suitable heat source. There were three main requirements for such a source: (1) a high rate of heat generation; (2) an easily and rapidly controlled output; and (3) a controlled variation of heat over different parts of the surface under test.

One suitable system was that which employed quartz infra-red lamps, which permitted a heat input to the surface of 20 kW/sq ft. The use of electronic controllers and large numbers of lamps provided suitable variations of temperature-pattern with time and on the surface, and this method was at present in an advanced stage of development. An important alternative was heating by electro-magnetic induction, which gave an extremely high rate of heat input. Disadvantages of this method were that the heat variation over the surface was less amenable to control, and the rate of heat production depended on the electrical and magnetic properties of the structural material.

The discussion after Dr. Walker's paper included the following points. From the stressing point of view, could heat and distributed loading be applied accurately together, or would there be a return to approximation? Dr. Walker replied that some simplification would be necessary, but, in general, bolder assumptions and increased complication would be required. Was there any method of detecting cracks inside structures? Not yet, in the lecturer's opinion. X-ray inspection schedules as provided for inspectors by certain American manufacturers, one speaker pointed out, were most valuable in the search for cracks.

After a break for tea the proceedings closed with a general discussion of topics raised during the day. The question of the fail-safe principle appeared first. Dr. Walker said he disliked applying the word "safe" to any type of failure, however limited in character. The aircraft should be so designed that it would not crack; if there were an error of judgment in this, then fail-safe design was legitimate as a first reserve. Mr. Oram (Bristol Aeroplane Co.) claimed that the fail-safe principle was a defence in depth which enabled aircraft to continue operating after a crack had appeared. Mr. Walter Tye (A.R.B.) suggested that this structural principle was approaching those which had been applied for many years to engines and equipment: 100 per cent reliability had not been assumed and so precautions had been taken to give non-catastrophic failure.

Concerning the properties of modern light alloys, Mr. Peel (High Duty Alloys) suggested that many troubles in the past had been caused by a lack of understanding by the detail designer. Materials had perhaps been blamed for design-office faults, and to move away from modern high-strength alloys would be a backward step.

Referring to the effect of dents and scratches occurring to aircraft in airline operation, Mr. Williams suggested that this type of damage should be simulated in all major fatigue tests. Dr. Hislop (Fairey Aviation) disagreed, urging that a practical evaluation of how much damage was done by the operator should first be made.

On the subject of g-restrictors, Dr. Walker denounced their use. They had not proved to be safety devices, he said; the initial concept was wrong and had been followed by literally disastrous results. The development of an autopilot capable of anticipating high values of g well in advance of maximum g would be a better approach. Another speaker claimed that too much attention had been paid to solving the practical aspects of the problem and not enough to tackling the theory. Mr. Giddings said he thought more use could be made of analogues on both static and dynamic problems. Earlier, another speaker had suggested (in connection with the calculation and measurement of flight loads) that stressing was an inaccurate science, and would not provide the solution. We should base flight-load work on an engineering approach, he claimed, rather than "bury our heads in the sand with a digital computor."

Summing up, Sir Arnold Hall suggested that the right path lay between the two extremes of the practical engineer and the long-haired theorist. It would not be wise, he thought, for designers to turn their backs on all modern devices.

MOUNTAINEERING AUSTER

HIGH-ALTITUDE mountain landings in New Zealand's snow-clad "Southern Alps" have recently been made in the ski-equipped Auster shown below, owned and piloted by Harry Wigley of South Canterbury. These flights have made possible easy access for skiers to the popular winter-sports region near Mount Cook (12,350ft). Wigley himself is a former champion ski runner, was an R.N.Z.A.F. pilot during the war, and is now one of the country's most experienced mountain pilots.

The use of ski-planes in the New Zealand mountains has the enthusiastic approval of Sir Edmund Hillary, who has already visited the Mount Cook region in the ski-fitted Auster. Sir Edmund did much of his preliminary mountain training for the successful Everest attempt in this district.

Professional photographers, too, have taken advantage of the flights to take heavy equipment to the snow-covered glaciers for mountain photography—the crisp picture below was taken a few weeks ago by Guy Mannering, a Christchurch photographer who is also an active mountaineer.

The ski-equipped Auster J.1d Aiglet, pictured on a snowfield on the Upper Tasman glacier near Mount Cook, New Zealand's highest peak.

40,000 ft. apart

Squadron Leader J. S. Fifield, D.F.C., A.F.C., by a recent successful ejection at ground level, demonstrated the capability of the latest Martin-Baker fully automatic ejection seat to bring about safe escapes near the ground at low forward ejection speeds. A further important requirement of an ejection seat lies in its high altitude performance. Martin-Baker fully automatic ejection seats are designed to bring the seat occupant safely down from the ejected altitude, stabilised and under control, to a selected altitude at which parachute deployment and separation of the occupant from the seat is automatically performed.

The altitude of the live ejection demonstrated at Chalgrove on October 25th was over 40,000 feet, and the altitude of separation 10,000 feet.

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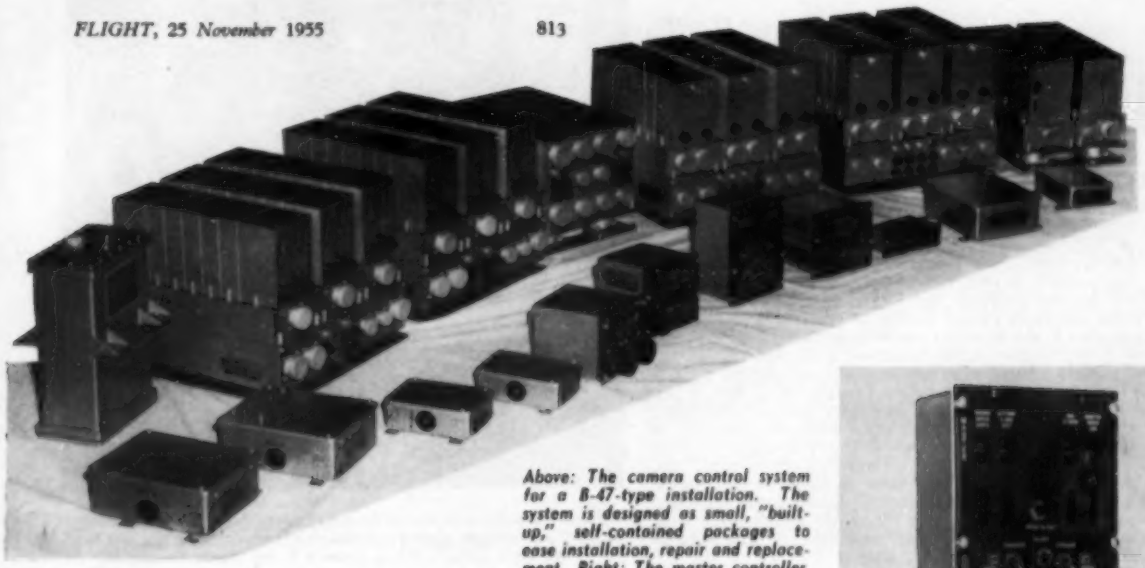
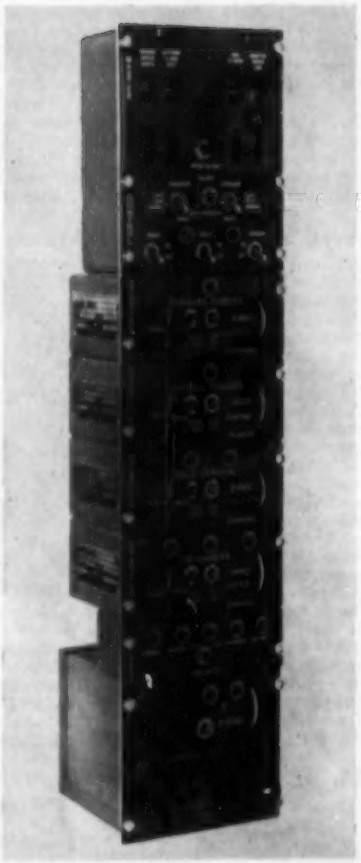




Above: The camera control system for a B-47-type installation. The system is designed as small, "built-up," self-contained packages to ease installation, repair and replacement. Right: The master controller.

P.R. BY AUTOMATION

First Details of an Automatic System of Camera Control

YEWKUS—"that dreamed-of aerial photographer with ten hands, a lightning-fast eye, and an absolutely phenomenal memory." Thus goes the publicity for the Universal Camera Control System (U.C.C.S.—or Yewkus, as it is known to U.S.A.F. photo-reconnaissance crews) designed by the Bill Jack Scientific Co. of Salona Beach, California.

Now fitted in 200 reconnaissance aircraft, ranging from B-26 to B-47, this fully electronic system is likely, it is claimed, to change the whole concept of photographic reconnaissance.

U.C.C.S. is supplied in various sizes for different installations. One of the smaller systems, for fighter aircraft, weighs 137 lb; a larger bomber system, of the type shown in the heading photograph, weighs about 400 lb—less, it is pointed out, than the weight of one crewman with ejection seat, oxygen equipment, pressurizing systems, and so forth. A typical six-camera fighter installation, weighing 145½ lb, contains 41 vacuum tubes, 37 relays and two electric motors. Total volume occupied is 3¼ cu ft. Unit price for a batch of 100 systems is approximately £3,500.

The form of packaging enables U.C.C.S. components to be distributed about the aircraft to take the fullest possible advantage of odd corners and is described as being "a nearly perfect solution to the problems of spare parts, replacement, storage, shipping and repair." The "block-built" nature of the design simplifies subcontracting and enables particular aircraft installations to be enlarged comparatively simply.

Computer portions of the control are installed in unpressurized areas of the aircraft, usually as close as possible to the cameras which are normally located amidships in the bomb bay. (In fighters they are installed in the nose.) It is claimed that the flexibility of U.C.C.S. allows for any number of cameras of negative sizes varying from 2¼in square to 9in by 18in, with lens focal lengths ranging from 3in to 36in.

Control of U.C.C.S. in, say, a B-47 would be the responsibility of the bombardier-radar-navigator. The master control panel, illustrated in the photograph, includes individual controls for each camera station, which may comprise as many as five cameras operated as a team. Other controls determine the release-rate of flash bombs or cartridges for night illumination, and, by means of a "memory delay," open the cameras just before the flash devices explode. A manual control over-rides the automatic system, and numerous safety devices ensure that warning is given should, for instance, bomb doors be closed when the cameras are opened, or if cameras are for any reason not operating.

AVIATION EXPORTS

AN analysis prepared by the S.B.A.C. shows that the total value of aviation exports from the United Kingdom from 1946 to June 1955 was approximately £372m. In 1954 the value amounted to £56.3m, compared with £65.5m in 1953. In 1955, to the end of June, exports had reached £30m.

Aeronautical exports in 1954 ranked fourth in the broad category of British general engineering products. Cars and chassis came first with £118.5m, a gain of £14.6m from the 1953 total of £103.9m, followed by commercial vehicles and chassis: £68.1m (1953, £63.3m) and "electrical machinery" £59.0m (1953, £60.3m).

Other statistics analysed by the Society include exports of general produce and manufactures from the United Kingdom in relation to air transport. In 1954, such exports carried by air reached a value of £60.4m and constituted 2.25 per cent of Britain's total exports. Imports by air, valued at £42.4m, accounted for 1.25 per cent of the total imports.

THE WORLD'S FINEST PHOTOGRAPHS

EVER since 1895, students of photography—and, indeed, all who appreciate the art of the camera—have been able to study, each year, a representative selection of the world's finest photographs collected within the covers of *Photograms of the Year*.* The new edition of this famous annual, now on sale, makes use of three different printing processes—including four-colour letterpress—designed to give the most pleasing interpretations of the various subjects.

In addition to the 120 plates there is a critical commentary on them by R. H. Mason, M.A., F.R.P.S., F.I.B.P., and other contributions by specialist writers include an article on colour photography.

**Photograms of the Year 1956: The Annual Review of the World's Photographic Art.* Published for *Amateur Photographer* by Iliffe and Sons, Ltd. Price 17s 6d (postage 8d). Size 10¼in by 8¼in; 8 pages full-colour letterpress plates, 16 pages monochrome letterpress plates, 96 pages monochrome photogravure plates, 32 pages text.

THE INDUSTRY

Dowty A.G.M.

PRESENTING his report at last week's annual general meeting of the Dowty Group, Mr. G. H. Dowty (chairman) said that there had been considerable changes in the structure of the Group and substantial advances in both profits and net assets. Profits had reached £1,492,027 before taxation, compared with £1,115,957 for the previous year. The incidence of taxation having been alleviated by the ending of the excess profits levy and a reduction in the standard rate of income tax, the available profits of £718,767 showed an increase of £319,908.

Others matters referred to by the chairman included the engagement of additional senior executives, among them Mr. S. D. Davies, formerly chief designer of A. V. Roe and Co., Ltd. Mr. Dowty also mentioned the Group's undertaking to equip one of the Remploy factories [for the employment of disabled workers] with plant for the manufacture of certain Dowty products. Mr. Dowty added "We believe that these factories, which are at present a heavy cost to the State, can be economically employed by industry. This experiment is eminently worth while from the national point of view, and we hope that it will encourage other industrialists to follow our example."

Avro's New General Manager

IT was announced last week that Mr. J. A. R. Kay, F.R.Ae.S., a director of A. V. Roe and Co., Ltd., and executive assistant to Sir Roy Dobson, the managing director, has been appointed general manager. Educated at Cheltenham College, Mr. Kay went from there to take up his apprenticeship in aircraft engineering, first with Armstrong Whitworth Aircraft, Ltd., Coventry, and later with A. V. Roe. After serving his apprenticeship, he remained with Avro in various appointments before leaving to become managing director of Northern Aircraft and Engineering Products, Ltd. He returned to Avro in 1941 as general superintendent, responsible for the co-ordination of daughter firms and sub-contractors engaged on Lancaster production. He was made executive assistant to Sir Roy Dobson in 1947 and joined the Board in 1950. He has travelled widely on behalf of A. V. Roe. Last year alone he made a 27,000-mile business tour, visiting Australia, New Zealand, the United States and Canada.

Mr. J. A. R. Kay.

H. M. Hobson Board Appointment

Mr. L. S. Greenland.

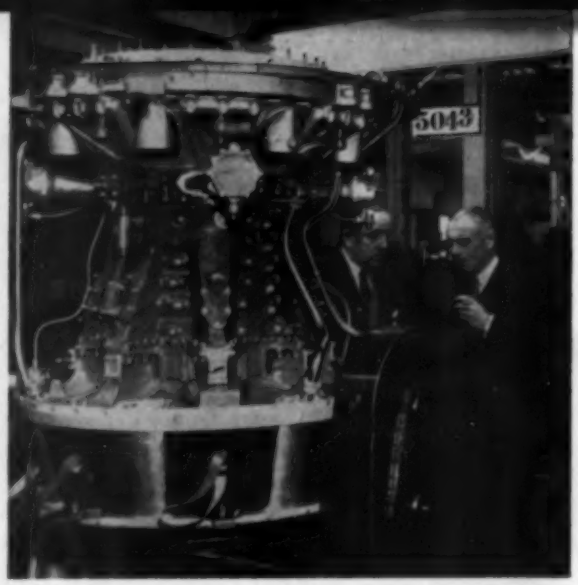
THE Wolverhampton firm of H. M. Hobson, Ltd., announces that Mr. L. S. Greenland, A.F.R.Ae.S., M.I.Mech.E., has been appointed to its Board. Mr. Greenland joined the Hobson design staff in 1934, becoming assistant chief designer in 1942 and chief designer in 1952. He has been concerned with fuel-control systems for most forms of airborne prime movers, and in latter years has been responsible for the design of a number of powered flying controls and servo units. A most recent undertaking has been the initiation of a control system for nuclear reactors. Mr. Greenland, who is 45 years of age, will continue to hold his position as chief designer.

Vickers Servicing Post

IT is announced that Mr. P. J. Stanbury has been appointed assistant service manager at the Weybridge Works of Vickers-Armstrongs (Aircraft) Ltd. Mr. Stanbury, who is 34, joined the Bristol Aeroplane Company as a student in their aero engine department in 1938. In 1940 he joined the R.A.F. as a fighter pilot and was awarded the D.F.C. in July 1942. He had a break from fighter duties from January to June 1942, during which he flew as a Vickers test pilot at Castle Bromwich.

In June 1943 he went as test pilot to Gloster Aircraft, and was subsequently their chief test pilot. In May 1947 he joined Elliotts of Newbury as chief test pilot. A year later he rejoined the R.A.F. Three years afterwards he left the Service, joining Vickers-Armstrongs Servicing School in 1951. He moved to the Service Department in 1953.

Mr. Stanbury has logged over 2,000 hours flying on 46 different types, including the Trent-Meteor, the first turboprop aircraft. He has been closely connected with the Viscount since its early days, and accompanied the prototype on its winterization trials and proving flights in North America.



A Proteus in building is studied by A. Cdre. Sir Edward Fielden, Captain of the Queen's Flight, during a recent visit to the Bristol Aeroplane Co. With him (left) is Mr. A. Eustace of the engine division.

IN BRIEF

Intended primarily for organizers of film shows for cultural and educational groups, and for those seeking visual aid for lectures, a comprehensive catalogue of Shell films on all subjects has been published by Petroleum Films Bureau, 29 New Bond Street, London, W.1. It includes, of course, details of the various Shell aviation films.

* * *

From the Knitted Mesh Manufacturing Co., 36 Victoria Street, London, S.W.1, who are specialists in wire knitting, comes the news that they have developed and are now testing mesh filters made from plastics. Useful applications are likely to be in aero engines and for vibrator cushions.

* * *

Equipment officially known by the Services as Radar, A.A., No. 3, Mark II has been renovated and modernized by Winston Electronics, Ltd. For the past four years the company have been re-building these trailers in comparatively large numbers for the British Government and for the Governments of South Africa and Ceylon; the rebuilt units are being used for mobile radar meteorological work.

* * *

A new publication, *Cutting and Metalworking Oils*, has been added to the range of technical books published by C. C. Wakefield and Co., Ltd. Strongly bound, and well illustrated, its 80 pages include a historical survey of metal working and cutting and describe the functions of cutting fluids. It includes chapters on handling, application and maintenance of cutting oils, and machining operations and recommended grades. Copies can be obtained free from the company at 46 Grosvenor Street, London, W.1.

* * *

Among papers presented at the 5th transport aircraft hydraulic conference, held in Detroit on November 2nd-3rd, was one by Mr. G. Alesbury, section leader (hydraulic design) at Vickers-Armstrongs (Aircraft), Ltd. Mr. Alesbury's paper discussed the hydraulic system used in the Viscount. The Conference was sponsored by the Detroit firm of Vickers Inc. to permit an open exchange of information on aircraft hydraulics, and was attended by representatives from 14 different airlines, and ten foreign and domestic airframe manufacturers.

CORRESPONDENCE

The Editor of "Flight" does not hold himself responsible for the views expressed by correspondents in these columns; the names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

Unexplained Accidents

IT seems to have become customary in certain sections of the Press and, indeed, with many people who should know better, to assume in the event of an unexplained accident to an aeroplane that the cause was, probably, the result of an error of judgment by the pilot.

After a recent most regrettable accident which resulted in the death of the pilot, comments which appeared in the Press and in the B.B.C. broadcast news and, later, remarks reported as having been made by the coroner concerned, were to the effect that the cause of the accident was possibly pilot error. It may be that, in this instance, the pilot did make a mistake, but there is as yet no shred of evidence to support such a conclusion. No accident should be the subject of comment in this way, bearing in mind that all are subject to a thorough and competent technical inquiry by expert technical investigators.

Unjust criticism of one not able to defend himself can cause unnecessary and undeserved distress to a pilot's family and to his colleagues, and is surely a trait not normally in keeping with the British character.

Many pilots, especially those engaged in test flying, can recall incidents which in less skilled hands or in less fortunate circumstances might have proved disastrous and which, in that event, would have been impossible of subsequent detection, except only that the pilot himself survived to bear witness.

I know that it is now usual to decry the once-revered dictum *de mortuis nil nisi bonum;* but need the pendulum be allowed to swing so far in the direction of premature and irresponsible comment on those who cannot answer back?

London, W.1. J. C. HARRINGTON.
Master, The Guild of Air Pilots and Air Navigators.

Before the Wrights

IN the recent correspondence discussing who were the first men to fly heavier-than-air machines, I am surprised that nobody mentioned Gustave Whitehead of America.

According to old books I have in my collection he built and flew in a steam-powered airplane at Oakland, Pittsburgh, in the spring of 1899. Whitehead, who was a friend and admirer of Lilienthal, also built the engine, which was a two-cylinder charcoal burner and a 4in bore and 10in stroke.

He carried with him as "fireman" on his first flight his mechanic, Louis Darvarich. The aircraft took off on its own three-wheeled undercarriage from a street in Oakland, assisted by firemen from No. 24 engine company and watched by a crowd of neighbours. The length and duration of this flight are not recorded but it ended with the aircraft failing to clear a tall building and crashing to the ground. Darvarich was badly scalded by steam from broken gauges and spent many weeks in hospital; Whitehead was uninjured.

Before the end of 1901 he had built no fewer than 56 airplanes. How successful they were I am unable to discover but he is quoted as saying "Airplanes must rise vertically from the ground if they are to become practical." I believe the Philips Aeronautical Library in America has recorded many of his deeds .

On August 14th, 1901, he made a 1½-mile flight at Lordship Manor, Bridgeport, Connecticut. This flight is recorded in the *American Inventor* of April 1st, 1902. The machine used was a monoplane made of steel tubing, spruce, pine and bamboo, the wings were covered with Japanese silk which was sewn on by the women of the neighbourhood in the Whitehead backyard at 241 Pine Street. Bracing was by piano wire attached to a central post over the fuselage. Power was supplied by a home-made four-cylinder two-cycle motor located forward in the boat-shaped fuselage, driving two tractor airscrews mounted one in front of each wing. Ignition was of the make-and-break type, dry batteries were used and a gravity tank held two gallons of petrol. Another motor, of unknown specification, was fitted to drive the wheels and so assist take-off. All-up weight was approximately 800 lb and about 965 lb with Whitehead on board.

On many of his early test flights he was accompanied by another mechanic, Anton Pruckner, who in 1934 said he well remembered these early hops.

On January 17th, 1902, Whitehead took off in a similar aircraft from the beach outside Bridgeport and flew along the shoreline for a distance of two miles. After landing and refuelling he flew off again, this time over Long Island Sound and made several turns and "figure eights" over a distance of about seven miles and then landed safely on the water. The motor used in this instance burned kerosine. Accounts of this flight were also published in the *American Inventor*, along with affidavits from eyewitnesses.

I wonder if any older American readers remember Gustave Whitehead, or if anyone knows what happened to all his inventions. JOHN GARWOOD.

Sutton, Surrey.

D/F Efficiency

IN your issue of September 16th there appeared a letter entitled "Radio Recollections." In it, Mr. G. Abrahams wrote with nostalgic touch about the "good old days" of M.F. D/F. and queried, "What has replaced it?" Obviously he has never heard of Malta homer.

This, a V.H.F. D/F. homer of standard pattern, stands some 880ft above sea level, distance from Tripoli 250 miles, Tunis 250 miles and Benina 430 miles. The homer usually maintains 5+5 contact with these points for at least two-thirds of the year. For example, I may quote the homer's 1955 record up to the present time. Strength 5 R/T. contact was established with Tripoli for the first time this year on March 26th. Contact with Benina came on the same day; Tunis was tested two days later. Last week we tested 5+5 with Tunis. This morning Tripoli and Benina were 5+5. Perhaps the above does not appear spectacular, but the following may cause a lifting of eyebrows. Malta homer frequently receives and transmits to aircraft which are south of Tripoli, east of Benina and north-west of Tunis—aircraft which are calling these stations but receiving no reply for the reason that they are out of range.

I think that Mr. Abrahams will agree when I say that a V.H.F. homer repeatedly passing class A bearings to aircraft which are on the average 500 miles away is not such a "sad affair." The standard range of a homer is put as 250 miles at Angels 10 (ground to air).

To state the entire case for Malta homer on paper would take a long time and a lot of paper, but I enclose copies of some "testimonials" of which we are very proud.

R.A.F. Dingli, Malta. L. A/C. HARMER.

[Among our correspondent's enclosures is this extract from H. F. King's *Flight* article "Middle East and Far East," published on May 29th, 1953: "Our last call was on the Malta homer station, which has achieved a very high reputation among Service and civilian pilots. Of standard R.A.F. pattern, the homer is above the sea and often 'works' aircraft at freak distances. One log entry we saw read: 'bearing 118, height 11.5, miles 625.' We were also shown a letter from Airwork, Ltd., to the 'Staff of the Malta Homer,' thanking them for their excellent work in connection with the Hermes down off Trapani last year. There is little glamour about these homers, but, truly, the R.A.F. would be lost without them."]

FORTHCOMING EVENTS

Nov. 29. Society of Instrument Technology: "Electronic Computing Methods," by A. St. Johnston, B.Sc., A.M.I.E.E., A.C.G.I.
Nov. 29. R.Ae.S.: Section Lecture: "The Noise of Jet Engines," by F. B. Greatrex, B.A., A.F.R.Ae.S.
Dec. 1. R.Ae.S.: Main Lecture: "Free Flight Techniques for High Speed Aerodynamic Research," by P. A. Hufton, M.Sc. (at Boscombe Down).
Dec. 1. R.Ae.S.: Graduates and Students Section: "Aeroelasticity in Practice," by H. S. Liner.
Dec. 2. Aircraft Golfing Society: Dinner and Dance.
Dec. 3. British Interplanetary Society: "Probing Interplanetary Space," by E. Burgess, F.R.A.S.
Dec. 6. Society of Instrument Technology: "Planning a Servo-mechanisms Laboratory for Instructional Purposes," by E. B. Pearson, M.Sc., A.M.I.E.E., A.F.R.Ae.S.
Dec. 6. R.Ae.S.: Section Lecture: "Fatigue Aspects of Structural Design," by W. A. P. Fisher, B.A., A.M.I.Mech.E.
Dec. 9. Helicopter Association: "Helicopter Turbine Installations," by A. W. Morley, Ph.D., M.Sc., A.C.G.I., A.F.R.Ae.S.
Dec. 16. London Airport Inauguration by H.M. the Queen.

R.Ae.S. Branch Fixtures (to December 9):—

Nov. 28, *Halton*, Film. Dec. 2, *Chester*, Annual Dance. Dec. 5, *Halton*, "Parachutes," by W. D. Brown. Dec. 7, *Bristol*, "A New Approach to Aircraft Design for Production," by W. E. W. Petter; *Brough*, "Aerial Photography," by Charles E. Brown; *Chester*, "The Pioneer," by N. J. Copper; *Reading and District*, "Airframe Fatigue," by W. Tye. Dec. 8, *Isle of Wight*, Annual General Meeting and Film Show. Dec. 9, *Glasgow*, "Test Flying," by Ben Gunn.

C.A.I.-I.A.S. JOINT MEETING

American and Canadian Delegates Hear Inaugural Rupert Turnbull Lecture

SOME 350 delegates attended the second annual joint meeting of the Canadian Aeronautical Institute and the Institute of the Aeronautical Sciences which took place in Ottawa on November 3rd and 4th. Nine technical papers were presented, and the conference included also a visit to Canada's National Aeronautical Establishment; presentation of the first W. Rupert Turnbull Memorial Lecture; and the annual dinner, at which Mr. C. D. Howe, Canadian Minister of Trade and Commerce, was guest of honour.

"Aircraft Structures" was the subject of the three papers presented on the morning of November 3rd; *Unique Structural Problems in Supersonic Aircraft Design* by F. P. Mitchell (Avro Aircraft), *Experiment and Theory in Investigating the Behaviour of Structures at High Temperatures* by Dr. N. J. Hoff (Brooklyn Polytechnic Institute), and *Optimum Structural Design of Wing Box Beams* by S. Bernstein (Canadair). The chairman of this session was Mr. B. J. Kaganov, chief structures engineer of Canadair.

During the afternoon, Mr. J. H. Parkin, director of the National Aeronautical Establishment, gave the inaugural Turnbull Lecture. Speaking on *W. Rupert Turnbull, 1870-1954*, Mr. Parkin reviewed the pioneering work of the noted Canadian aeronautical engineer from the technical and historical viewpoints. The late Mr. Turnbull constructed a wind tunnel and began experiments on aircraft wing shapes in 1902. Subsequently turning his attention to airscrew theory, he won the Royal Aeronautical Society's Bronze Medal in 1911; and developed an electrically controlled variable-pitch airscrew which was successfully flight-tested in 1927. The chairman of the Turnbull Lecture was Mr. T. E. Stephenson, director of the aircraft branch of the Department of Defence Production, Ottawa.

The annual dinner, on the evening of November 3rd, was attended by over 700 members and guests. Mr. R. D. Richmond, president of the Canadian Aeronautical Institute, introduced Mr. C. D. Howe, who gave some reminiscences of the development of Trans Canada Airlines and Canadian Pacific Airlines.

On Friday, November 4th, two morning sessions were held. At one of these, materials and processes were discussed, the papers being *Aluminium Alloys for Elevated-temperature Service*, by E. H. Dix, Jr. (Aluminium Company of America); *The Metal Bonding of Assemblies for the Canadair CL-28 Maritime Reconnaissance Airplane*, by J. J. Waller (Canadair); and *Materials and Fabrication Techniques for Structural Heat-resistant Plastic Sandwiches*, by N. E. Wahl (Cornell Aeronautical Laboratory). Mr. H. L. Eberts, president of Fleet Manufacturing, Fort Erie, was the chairman for this discussion.

The subjects of the other session, of which Mr. I. A. Gray (director of engineering and maintenance, Canadian Pacific Airlines) was chairman, were "Design for Aircraft Safety," and "Aircraft Accident Investigation." The three lectures given were *Significant Problems in Air Safety*, by Jerome Lederer (Flight Safety Foundation and Cornell-Guggenheim Aviation Safety Center); *Aircraft Accident Investigation Techniques*, by G/C. R. C. Davis (R.C.A.F.); and *Recent Results of N.A.C.A. Crash-fire Research with Jet Airplanes*, by I. I. Pinkel (N.A.C.A. Lewis Flight Propulsion Laboratory).

During the afternoon of November 4th, delegates were taken on a tour of the laboratories devoted to research in structures, high-speed aerodynamics, gas dynamics and engines at the National Aeronautical Establishment in Ottawa. They also visited the hydraulic and ships laboratory of the National Research Council.

HELICOPTER STATIONS DISCUSSED

LAST week we published abstracts from a paper, *The Design of Helicopter Operating Sites*, given before the Helicopter Association on November 11th. The lecturer was Mr. H. T. Hough, M.I.C.E., M.I.Mun.E., City Engineer and Surveyor of the City of Liverpool. A discussion followed the paper, and points from it are given below.

The chairman, Dr. G. S. Hislop, thanked the lecturer for giving "such an excellent paper" and mentioned that in the large audience there were officials from many of Britain's important cities including Edinburgh, Plymouth, Torquay, Derby, Nottingham, Bristol and London. Representatives from Rotterdam and Düsseldorf were also present. He opened the discussion by reading a written contribution from

M. Vernieuwe (Sabena), who agreed with the lecturer that it would be most helpful if some official pronouncement on heliport requirements and sizes could be made; but that already the I.A.T.A. helicopter working group had made numerous definite statements in relation to these matters and these represented the views of all the present helicopter operators. In one section of their report, for example, it had been laid down that a landing strip measuring 400ft × 200ft would be of sufficient size, and the dimensions of the area required for parking a helicopter should be 1.25 times the rotor diameter. He thought that refuelling from static, flush-fitting hydrants was preferable to the use of mobile equipment.

Mr. G. Stalibrass (M.T.C.A.) then made a long contribution in which he said that, speaking personally, he was not convinced that the helicopter would automatically become a successful vehicle for inter-city transportation. It would need much development, spurred on by considerable enthusiasm on the part of rotating-wing protagonists, to make it so. He thought that cities could not be pioneers in the provision of landing sites and, at the same time, expect official guidance to be forthcoming to remove the element of chance in the construction of landing grounds. He suggested that local authorities should decide for themselves. They might start by providing sites which would be suitable for the operation of helicopters having only single-engine performance, in the knowledge that when multi-engined machines were available their improved performance would allow building restrictions in the vicinity of the station to be relaxed.

On the question of noise, M.T.C.A. had had more complaints arising from helicopters' climb-away than from any other flight condition; he thought, therefore, that manufacturers should aim at providing a really steep angle of climb in transport helicopters. Climbing into any cloud that was present (assuming instrument flying requirements could be met) would reduce noise. He did not think the helicopter would do much to relieve surface-traffic congestion.

Mr. J. Tillema (Deputy-General, Rotterdam Town Planning Authority) said that the paper was worthy of study by other town-planning authorities because the future of the helicopter depended to a large extent on how the heliport question was solved. With a traffic frequency of three flights per day on the Rotterdam-Brussels service they had never had any complaints regarding noise. He felt it was, perhaps, more important that manufacturers should first seek to reduce noise *inside* the cabin. He preferred the use of landing aprons connected by taxiways, as at Rotterdam heliport, to the lecturer's proposal of two landing strips; and he also suggested that all terminal buildings should be built with the thought that they were only provisional. Until helicopter services were fully developed, the type and extent of accommodation required for passenger handling could not be determined accurately. With improved helicopter performance in the coming years, he did not think the use of ground-level stations would necessarily sterilize adjacent land in city centres. Nevertheless, roof-top sites did have certain advantages in some cases.

Herr L. G. S. Praing (a Düsseldorf architect) considered that roof-top sites were more suited to the requirements of a large city. The constructional problems were not so difficult as had been assumed and an impact load of 3g to 4g could easily be supported. He thought that town-planning officers should show more initiative as so much time had already been lost.

Mr. R. H. Whitby (B.E.A.) referred to the problem of the effect of rotor downwash on adjacent streets and produced a diagram which illustrated the results of tests made earlier with Bristol 171 and Westland Whirlwind helicopters. At the edge of a circle of just over 100ft radius, an airstream of 10 kt could be felt from these machines. With a large 40,000 lb helicopter, it had been calculated that the same airstream would be felt at a distance of approximately 300ft.

Mr. Raoul Hafner (Bristol Aeroplane Co.) agreed with many of the lecturer's points but said it was uneconomical to build a twin-engined helicopter capable of hovering on one engine. The twin-engined machine should have *en route* single-engine performance and the backward take-off technique should be used to meet safety requirements at city-centre stations. He suggested a means whereby local authorities could plan for helicopters while not committing themselves to too great a capital outlay. An L-shaped building should be provided initially to allow for two small strips on the roof at right angles measuring 300ft × 100ft. This would be adequate at the outset and when helicopter traffic increased the other two sides of the square could be completed, thus doubling the landing and take-off facilities.

Dr. G. S. Hislop (Fairey Aviation), the chairman, said he felt there would ultimately be a design requirement for all transport helicopters to be capable of continuing a climb after partial power failure.

Mr. Hough, in reply to the discussion, thanked the contributors for the points they had made. He agreed that the helicopter would not solve the traffic problem completely, but he thought it would certainly relieve it. He was glad that Sabena had received no complaints regarding noise and was hopeful that this factor might safely be left to be dealt with by the manufacturers, and therefore ignored by local authorities when choosing a suitable site. He thought most of the building restriction and siting problems would disappear if the industry could design and produce a helicopter capable of climbing vertically to 200-300ft after take-off, with adequate safety factors.

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Rescue

Minesweeping

Reconnaissance

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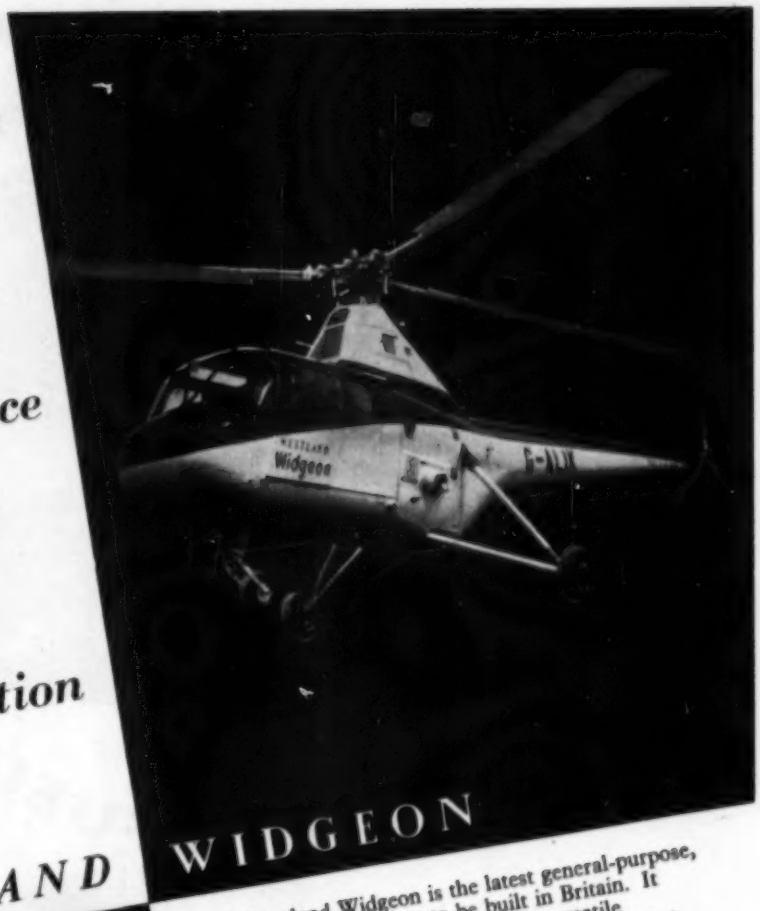
Trooping

Casualty evacuation



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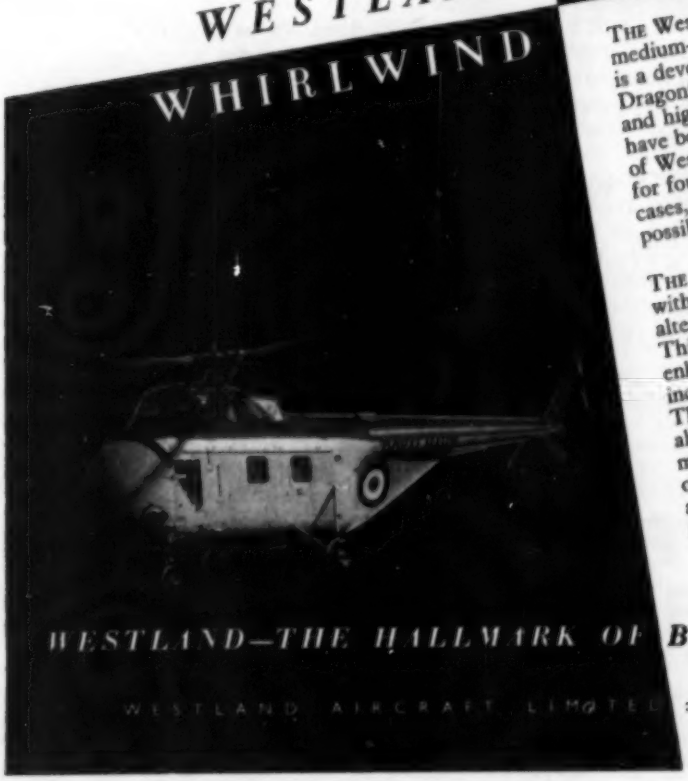
WESTLAND WHIRLWIND



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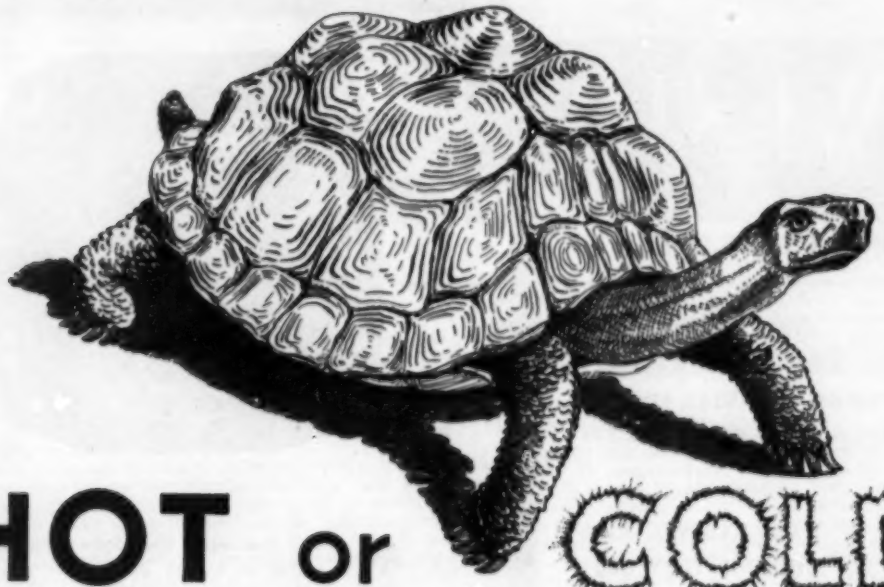

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Flight deck of H.M.S. Warrior taken during exercises in the Japanese Inland Sea

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This Britavia Hermes, seen taxying-in at Blackbushe, last week became the first aircraft of its type to fly the Atlantic. The occasion is recorded in a paragraph below.

CIVIL AVIATION

EIGHT '8s FOR K.L.M.

THE first export order for the Douglas DC-8 was announced simultaneously by the manufacturers and the airline concerned, K.L.M. Royal Dutch Airlines, on November 16th. The airline has ordered eight DC-8s, costing, with spares, £18.5m, with delivery beginning in March 1960. K.L.M.'s president, Gen. I. A. Aler, said that the aircraft, carrying more than 100 passengers at 550 m.p.h., would be used on the North Atlantic "and other important intercontinental routes."

The announcement said that K.L.M.'s DC-8s would be powered by Pratt and Whitney turbojets (presumably J75s), and would have a gross weight of 257,000 lb; payload would be 34,000 lb. K.L.M.'s choice of the DC-8 is significant for several reasons. It is widely believed, rightly or wrongly, that the Dutch airline has a profound influence on procurement policies of many airlines outside America; certainly the technical experience and business acumen of K.L.M.'s executives are widely respected. Their purchase of the DC-8 will thus be interpreted as an act of faith in the Douglas company's ability to produce an efficient, money-making jet transport. Moreover, K.L.M. have unequalled experience of the Douglas series of commercial aircraft, having operated or ordered every model since the 1934 DC-2.

Including the DC-8 order, K.L.M. now have £35-40m involved in future aircraft procurement. The other aircraft on order are four L.1049Gs (for delivery in 1956), ten DC-7Cs (1957), nine Viscount 803s (1957) and two Friendships (1958).

It is thought likely that S.A.S. will follow K.L.M. in ordering American jet transports. The Scandinavian airline is at present known to be evaluating both the Boeing and Douglas designs.

VIKINGS FOR THE ARGENTINE

SOLD to the Argentine Government by Eagle Aircraft Services, Ltd., four Viking 1Bs will be flight-delivered to Buenos Aires at the end of this month *via* Gibraltar, Dakar, Natal and Rio de Janeiro. As these stages are beyond the normal capacity of the Viking, the aircraft have been specially modified—as illustrated below—in the Eagle workshops at Blackbushe. Two additional fuselage tanks, each of 220 gal capacity, have been installed, giving an endurance of 12 hr and thus enabling the aircraft to cover up to 2,400 miles. The tanks are all-metal units fitted inside suitably stressed wooden containers; feed is fully automatic.

DRAGON AIRWAYS ACQUIRED

PURCHASE of Dragon Airways has been announced by Hunting-Clan Air Transport, the Elder Dempster Group and the Tyne-Tees Steam Shipping Co. Controlled by these three companies as equal partners, Dragon Airways have been taken over for the purpose of developing the northern network of scheduled services run by Hunting-Clan. Under this agreement Dragon's name will be changed, their capital structure reorganized and their base moved from Liverpool to Newcastle. During recent months Dragon's Herons have been operating under charter to Hunting-Clan, who regard these aircraft as well matched to the traffic demand on most of their Newcastle-based routes.

Viking ferry tanks installed by Eagle Aircraft Services (see story above).

TRANSATLANTIC HERMES

ONE of the six Handley Page Hermes operated by Britavia, Ltd., last week became the first aircraft of its type to fly the North Atlantic. Carrying 39 passengers on both outward and return trips, it was chartered to carry relief members of a ship's crew to New York and to return the replaced men to the U.K. The aircraft, Hermes 4 G-ALDU, left Blackbushe on November 14th and reached New York in 17 hr 15 min flying time *via* Shannon and Gander; it returned *via* Gander in 16 hr 9 min. It was commanded by Britavia's flight captain, Capt. W. P. Allan.

FRENCH WITHOUT TOWERS

LOSS of revenue resulting from the strike of traffic control staff at French airports, which began at Paris on November 10th and spread rapidly to other French terminals, was last week estimated to be in the region of £100,000 daily. The French Ministry of Transport last week issued a statement recognizing that the wages of certain categories of staff were insufficient, but denying the strikers' demand for a flat bonus of about £10 a month.

Services between London and Paris were resumed last Monday on a limited frequency after being suspended for seven days. B.E.A. operated two Elizabethan services between London and Creil, north of Paris; Air France operated a Constellation service from Orly; and Skyways resumed their normal coach-air service between Beauvais and Paris. The Air France and B.E.A. frequencies were expected to increase day by day, though the strike was still in force at the time of going to press.

JERSEY AIRLINES EXPANSION

UNDER an agreement between B.E.A. and Jersey Airlines, announced last week, the latter company is expected to take over a number of the Corporation's Channel Island services from April 6th next year. The routes concerned are those between Guernsey and Southampton, together with all services now operated by B.E.A. with Rapides. Commenting on these developments, Jersey Airlines recall that in 1953 they received approval to operate all the routes now to be taken over from B.E.A. Conditions of approval were so onerous, however, that the company could only have operated these sectors at a loss.

Formed as recently as 1949 Jersey Airlines have expanded at an impressive rate. The success of the company is closely linked with that of the de Havilland Heron feederliner, for Jersey were the first British airline to adopt the Heron; their flagship, *Duchess of Jersey*, was in fact the fifth production machine. Four Herons are now in service, together with three Rapides, and three more have been ordered for delivery before the end of March 1956. From April next, therefore, it will be possible to operate all Jersey's routes, with the exception of some Alderney services, with Herons. By the summer of 1957, when additional Herons will be added to the fleet, the Rapide will no longer figure in the company's timetables, though one of these aircraft may be retained for charter and ambulance work.

CUSTOMS DELAYS ALLEGED

IN a Parliamentary question on November 10th, Mr. William Shepherd asked if the attention of the Chancellor of the Exchequer had been called to the "delay in the clearance of air freight at London Airport occasioned by the Customs people at London Airport refusing to work late at nights and at weekends." Replying, Mr. Henry Brooke, Financial Secretary to the Treasury, said that he was not aware of any delay attributable to the lack of Customs facilities. Customs procedures had already

CIVIL AVIATION . . .

been adapted to facilitate the clearance of freight; officers were available at all times to deal with what Mr. Brooke called "really urgent traffic."

Mr. Shepherd asked if Mr. Brooke realized that his statement was at variance with that expressed by B.E.A., to which Mr. Brooke replied that he would look into any particular case of alleged delay. His information was that, in general, people using the airport were very satisfied.

A further question, by Mr. Frank Beswick, referred to "allegations that there is greater delay in clearing freight for the British Corporation than for the American concerns for certain stated reasons, and that there are a number of known cases in which long-term freight contracts have been moved from the Corporation to American concerns, simply because they are cleared through the Customs more quickly."

Mr. Brooke said he could not believe that there was anything in these allegations, but he promised to examine any information which Mr. Beswick cared to send him.

SOUTH BANK SERVICE TO END

FOLLOWING B.E.A.'s announcement, on November 8th, that their helicopter service between the South Bank and London Airport would be withdrawn on March 31st next, the Minister of Transport and Civil Aviation, Mr. J. A. Boyd-Carpenter, was asked in the House of Commons why he proposed to stop the service. Replying, the Minister said he had taken no such decision, and that no application to vary the routes served by B.E.A.'s helicopters had been made to him. He would no doubt be considering the matter within the next few weeks.

According to the B.E.A. statement the South Bank service was "only intended to operate experimentally for a limited period." It would be replaced by services linking London with Birmingham, Leicester and Nottingham. Removal of the floats now fitted to the aircraft would enable them to carry seven passengers instead of four on the new inter-city routes.

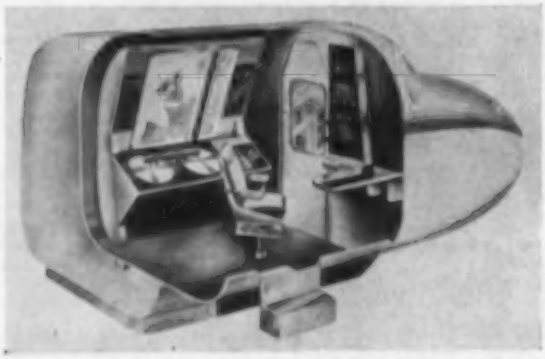
Another question on the South Bank service was raised in the House of Commons on November 15th, when Mr. Boyd-Carpenter was asked whether he was aware that helicopter flights to London Airport were scheduled to arrive 1½ hr before fixed-wing departures. Mr. Boyd-Carpenter replied that the helicopters, now operating four return trips daily, were not scheduled to connect with a particular flight. It was for passengers to decide which provided the most convenient connection with the aircraft on which they were flying. In their present stage of development, helicopters were liable to restrictions on the number of passengers carried or to cancellation of flights at short notice. B.E.A. therefore advised passengers in their own interests "to arrange helicopter flights an hour early in order to leave time for travel by coach to London Airport if the helicopter has to be cancelled." This, said the Minister, was a matter of commercial operation for B.E.A.

NEW REDIFON TRAINER

ORDERS for three synthetic-flight trainers of a new type are announced by Redifon, Ltd. The trainer, developed by the company's flight-simulator division, represents a stage between the primary ground trainer and the more comprehensive flight simulator. Its design was based on the outcome of consultations between Redifon engineers and leading Commonwealth and European airlines. Described as a "universal" instrument flight trainer, the equipment is completely self-contained. It is electro-mechanically operated and incorporates analogue computers.

The first two trainers have been ordered by Sabena for delivery early in 1956, and will be used for conversion training of crews selected for the airline's new DC-7Cs and Convair 440s. The DC-7C trainer, incidentally, will be the first equipment of its kind to embody the Sperry integrated flight system. A third model, ordered by K.L.M. for converting L.1049G crews, will be the first to incorporate facilities for training pilots for storm warning radar.

The layout of the new flight trainer developed by Redifon is shown by this artist's impression. Behind the flight deck, which is representative of that of a typical multi-engined transport, are track recorders, an approach recorder and instructor's console; on extreme left are computers and power-supply racks.



AIR FRANCE BUY CARAVELLES

AS forecast in *Flight* for September 30th, an order for the S.E.210 Caravelle jet transport has been placed by the French national airline, Air France. The order, announced on November 17th, is for 12 Caravelles with an option on a further 12. The announcement credits the aircraft with a range of 1,900 miles when carrying 70 passengers at a cruising speed of 470 m.p.h.

The two Rolls-Royce Avon turbojets, installed in pods on either side of the rear fuselage, are stated to deliver 10,500 lb s.t., which suggests the use of the Ra29 version of this engine, as specified for the Comet 4. The delivery date is not given, but the statement says that Caravelles will go into service with Air France towards the end of 1958.

B.O.A.C.'s NEW DEPUTY CHAIRMAN

THE appointment of Lord Rennell of Rodd as deputy chairman of B.O.A.C., in succession to Mr. Whitney Straight, was announced last week. Lord Rennell, who is 60, joined the board of B.O.A.C. in March 1954 but has had no previous associations with the air-transport industry. He is experienced in financial matters and is a partner in Morgan, Grenfell and Co. It is stated that Lord Rennell's new appointment will be on a part-time basis.

Sir Miles Thomas, chairman of B.O.A.C. is quoted by *The Times* as saying that in having a part-time occupant in the post of deputy chairman the Corporation was reverting to earlier practice. B.O.A.C. were now engaged in financing the purchase of new aircraft, both for themselves and for their associates in the West Indies and the Middle East. As deputy chairman Lord Rennell would be closely concerned with these aspects of B.O.A.C.'s activities, and would work closely with Mr. Basil Smallpeice, deputy chief executive and financial controller.

ANGLO-RUSSIAN AGREEMENT

SIGNING of an interline agreement between B.E.A. and Aeroflot, the Russian airline, took place in Moscow on Saturday last, November 19th. The agreement provides for connections between the two airlines' services at Helsinki and Vienna (and later, possibly, at Berlin). Passengers travelling between London and Moscow will change at Helsinki, to which B.E.A.'s Viscount service will be extended in April next, and Vienna will be the gateway for travel to and from destinations in southern Russia. A further result of the agreement is that each airline will now be able to offer single-ticket travel to any point on the other's network.

Both British and Russian participants in the talks which preceded the agreement have stated that there is no immediate prospect of direct air services between the two countries.

ASSURANCE FOR ENGINEERS

FUTURE B.O.A.C. policy on the carriage of flight engineers is set out in a statement published in the annual report of the Navigators' and Engineer Officers' Union. The text of the statement, which was made by the Corporation in answer to representations by the Council of the Union, is as follows:—

"It is the policy of B.O.A.C. for the foreseeable future to include a flight engineer officer in the complement of new-type aircraft to be operated by the Corporation.

"It is not the intention to have a separate engineer's station in new-type aircraft requiring to be continuously manned and furnished with instruments and controls duplicating those provided for the occupants of the captain's and second officer's seats.

"The duties of the flight engineer officer in the crew complement will vary with the type of aircraft and the particular operation for which it is being used; for instance, he may be required to relieve the second pilot during certain stages of the operation. It is the aim to bring flight engineers up to an equivalent standard of knowledge with a fully licensed 'A' and 'C' engineer on the type being operated. He would be expected to diagnose and rectify such faults as may develop and can be made accessible for rectification in the air. He would be able to signal information ahead when rectification will be required at the next staging post, diagnosing the fault being experienced and advising as to work or replacements required. He would, further, be able to supervise and/or assist in such rectification at staging posts where he may well be the most experienced engineer on the type of aircraft being operated.

"The flight engineer officer will be a member of the operating crew and have full status as such in the crew complement."

BREVITIES

DETAILS of procedures for obtaining permission to make non-scheduled flights to various overseas countries are set out in M.T.C.A. *Civil Information Circular* No. 118/1955.

* * *

Subject to the approval of the Air Transport Board, two of Canada's independent airlines have agreed to merge. The airlines concerned, Associated Airways, Ltd., Edmonton and Pacific Western Airlines, Ltu., of Vancouver, operate a total of some 75 aircraft, including single-engined types.

* * *

South African Airways are now preparing for delivery of their three DC-7Bs, the first of which is due to leave Santa Monica on February 13th next, arriving on February 16th. The second and third aircraft are due to follow in March. Flight crew members and ground staff chosen for Douglas conversion courses leave for America early next month.

* * *

As part of India's second five-year plan, the number of Viscounts ordered for Indian Airlines Corporation will be increased from five to ten, according to a recent announcement by the Indian Communications Minister. It was also stated that 28 smaller transport aircraft would be bought for I.A.C., including, probably, an additional batch of Herons.

* * *

B.O.A.C., in common with some other transatlantic airlines, are now offering a 40 per cent fare reduction to United States servicemen travelling on leave between Europe and the United States. The concession should result in extra traffic from Burtonwood, the U.S. base which now serves as terminal for B.O.A.C.'s Stratocruiser service between Manchester and New York; men stationed there will be able to make the return trip for £108 19s.

Aer Lingus announce a net profit of £307,000 for the first half of the current financial year, an increase of £94,000 on the profit for the corresponding period last year.

* * *

The ceremonial opening of the D. F. Malan Airport at Cape Town, which had been in operation for some 14 months, took place on October 26th. Built at a cost of approximately £2m, the airport has a main runway of 6,900ft.

* * *

Airwork, Ltd., announce the appointment of Mr. J. Syme as commercial regulations superintendent. Mr. Syme, who will also deputize for Airwork's commercial manager, is a specialist in air freight and was until recently employed in T.C.A.'s head office in Montreal.

* * *

Eagle Aircraft Services, Ltd., were responsible for design, development and installation of the modified undercarriage fitted to the two Autair S-51s taking part in the Hunting Aerosurveys expedition to Grahamland. The undercarriage, illustrated in *Flight* of October 21st, incorporates skids designed to prevent the aircraft from sticking to ice or snow after touch-down, and special lightweight skis for attachment to the wheels.

* * *

Details have been published by American Airlines of an arrangement whereby the Metropolitan Life Insurance Co. will partially finance the carrier's £47m order for 30 Boeing 707s. The agreement takes the form of a 4 per cent note issue, and provides for advances, in varying amounts and totalling £26.8m, during the years 1956-59 inclusive; repayment will be made in equal annual instalments between 1967 and 1996.

CLUB AND GLIDING NEWS

FIRST organized evening function at the newly opened Kronfeld Club near Victoria Station, London, was a well-attended film show on Wednesday, November 16th. *Air Parade, Rig 20,* and *The Power to Fly* (all Shell films) were shown, in addition to an amateur film of pre-war flying at Hanworth and Brooklands, brought along by John Holder of the Southdown Gliding Club.

The Kronfeld Club has been founded to encourage and popularize gliding and light-aircraft flying. Its aim, as quoted on the membership form thrust into the hand of *Flight*'s representative at the film show, is "to provide a meeting place in London for enthusiasts, whether potential or 'old hands'." Its formation, naturally enough, has received the support of the Popular Flying Association and British Gliding Association, and the yearly subscription to the club is only 10s.

The work of redecorating the condemned basement flat which forms the premises has progressed well, and the lounge and bar are almost complete. Their most pleasant appearance reflects an impressive amount of solid hard work by members—but much remains to be done, including the decoration of the third large room, in which the film shows, talks and other meetings will be held. Enquiries should be addressed to the Hon. Secretary, The Kronfeld Club, 74 Eccleston Square, London, S.W.1. At present the club is open from Monday to Friday from 6 to 11 p.m., with bar and Espresso coffee-bar service; it is hoped that, as more members join, the facilities may be increased.

THE Yorkshire Aeroplane Club at Sherburn-in-Elmet achieved a total of 75 hours flying during last month. First solos were made by Messrs. A. Townend and P. Bussey. All the group's A.T.C. cadets have now completed their flying scholarship training and five of them are entering the R.A.F. Mr. Frank Thackeray has resigned from the chairmanship of the club's social committee, although he is continuing to serve on the general committee. The club's last Saturday-night social was held on November 19th, and is to be followed by others on December 3rd and December 17th.

THE veteran Slingsby T21b "Daisy," owned by Imperial College and operated by the Surrey Gliding Club at Lasham, has now performed over 20,000 launches in its 6½ years of life. During this time it has trained over 1,000 pupils, and has required only minor repairs and replacements. It is thought that this is probably a record for any glider in the U.K., and possibly in the world.

A NEW Works Flying Club has been formed at Christchurch Aerodrome, open to employees of Vickers-Armstrongs (Aircraft), Ltd., at Hurn. The club consists of eighteen members, who will pay only 6s per hour for their flying, the remaining 90 per cent of the cost being provided by the company. Flying operations are to begin on December 1st, by arrangement with the Christchurch Aero Club. President of the Vickers Club is Mr. G. R. Edwards, and the Vickers chief test pilot at Hurn, Mr. David Glaser, is chairman.

Mr. Don Doyle.

A TOTAL of 335 flying hours was logged by members of the Fair Oaks Aero Club during October. Private pilots' licences were obtained by Messrs. Howard, Hughes, Roberts, Jarred, Cobbett, Brock, Miller, Crudgington, Frith, Knowles, Sydney, D. G. Jones, Meager, Lister, and A.T.C. Cadet Charrington. First solos were made by Miss Treeby, Messrs. McAuley and Thornber, and A.T.C. Cdt. Sgt. Mason. Don Doyle, who learned to fly with the club three years ago and who has since become an honorary instructor at Fair Oaks, is about to return to the U.S.A., where he hopes to take up airline employment. Club members attended a farewell dinner in his honour at Weybridge on Friday last, November 18th. The club's winter course of lectures for the P.P.L. examination subjects has begun; lectures are held on Tuesday evenings and are being augmented with instructional films.

ACCORDING to the October issue of the *Popular Flying Association Bulletin*, the number of active co-ownership groups affiliated to the Association is now 41. One of the most recently formed is 61 Squadron Flying Group, which operates at R.A.F. Station Upwood. A progress report on another Service group, that of No. 47 Squadron at Abingdon, records a marked increase in flying hours since May of this year when a Tiger Moth replaced the Club's Hawk Major. Fourteen members of the 47 Sqn. Group have flown solo and two have obtained their P.P.Ls.

The first aircraft to be used for training under the new "Permit to Fly" system is the two-seater Aeronca Champion operated by the Hookwood Flying Group, based at Gatwick. A disturbing piece of news which the bulletin reports is that this group has been given notice to quit its accommodation at Gatwick because of work beginning on the new extension scheme. The present position is that the group's operations may continue at Gatwick until next August. The Warwickshire Aero Club (P.F.A. Group No. 49) held the official opening of their new clubhouse, which has been re-designed and newly furnished. The club is anxious to welcome visitors by air from other groups.

V.1000—A BID ABANDONED

Controversy at High Levels: the Long-haul Situation Reviewed

THE implications of the Government decision to abandon the Vickers V.1000 can be assessed with accuracy only by future historians. But from all that has been said by the parties concerned it is possible to form one clear impression: except from the manufacturers, there have been few voices raised in loud protest. This would be surprising if only one issue—the cancellation of an expensive and already well advanced national undertaking—were involved; but the fact that the dropping of the V.1000, to use the words of Mr. George Edwards, managing director of Vickers-Armstrongs (Aircraft), "means we have abandoned to the Americans, without a struggle, a highly important market," makes the absence of dissent doubly surprising.

Comment, inevitably, has concerned not only the V.1000 but broader issues involving the whole future of British long-haul transports and the American types with which they will have to compete. It is appropriate to record the views expressed on these matters during the past two weeks.

Giving its reasons for the cancellation of the V.1000, the Ministry of Supply stated: "During development the weight of the V.1000 had grown substantially and had outstripped the engine capacity. It had taken longer than was expected to solve the problems of meeting the specifications of the R.A.F." Mr. George Edwards pointed out that the increase in structure weight, which had been necessitated by the decision to make the V.1000 a transatlantic airliner, had in fact been fully matched by increases in power of the Rolls-Royce Conway and that the V.1000 could have been in all ways competitive with the DC-8 and 707 "and in some ways better."

To substantiate their claim Vickers have released weights and performance details of the aircraft, which are included on page 794.

It is understood that R.A.F. Transport Command, faced with the prospect of an over-weight V.1000 for which suitably developed Rolls-Royce Conways would not be available until 1958, decided that they could not wait until that date. Since the Hastings-replacement situation is becoming urgent, the order for six Britannia 250 L.R.s was placed instead. (It is unlikely, however, that these aircraft could be in squadron service before 1957.)

The Vickers view is that the DC-8 and the Boeing 707 are unlikely to have engines capable of non-stop Atlantic operation before 1960, and that the V.C.7 would have been capable of performing a non-stop service in both directions by 1960. In the opinion of Mr. George Edwards the decision to cancel the aircraft "is a national disaster we shall regret for many years."

Of particular interest was the B.B.C. Television discussion on November 14th between Mr. Woodrow Wyatt for the B.B.C., Mr. George Edwards for Vickers, Mr. P. G. Masefield for Bristol, Sir Miles Thomas for B.O.A.C., and Mr. C. T. Wilkins for de Havilland.

Asked why B.O.A.C. could not have ordered the V.C.7 despite the military V.1000 cancellation, Sir Miles said that the Comet 4 was more suitable for the Empire routes; that the few V.C.7s required for transatlantic operation, say six, would not justify production; and that the aircraft in any case would be very demanding as to airport requirements. Mr. G. Edwards, when asked why, in view of the promised performance of the V.C.7, Vickers did not go ahead without an R.A.F. or B.O.A.C. order, pointed out that the initial operation of a large and complex aircraft could only be undertaken satisfactorily in the hands of home operators.

Mr. Masefield said he believed that the Britannia would be in transatlantic service a good deal ahead of the American jets and would make a very good show of itself even after they had been introduced. He believed that the DC-8 and the 707, with the engines at present projected, would not be genuine non-stop aircraft, whereas the Britannia 300 L.R. would be. He contended, however, that Britain must take a very serious account of the American jets and that in his opinion the country should be on the Blue-Riband route with jet as well as turboprop transports.

Asked what B.O.A.C. would do about DC-8 and 707 transatlantic competition in 1960, Sir Miles Thomas was of the opinion that it would not be until 1962 at the earliest that the Americans would have these aircraft in non-stop transatlantic service. Britannias would be achieving this within two years from now. He dismissed the possibility that B.O.A.C. would have to buy U.S. jets for the moment and affirmed his confidence that the British aircraft and engine industries would in due course surmount U.S. jet competition. Asked whether the industry had been told of the necessary requirements, Sir Miles said these had been made clear to a joint committee of the industry and the Ministry of Supply and that design studies were being made at the moment.

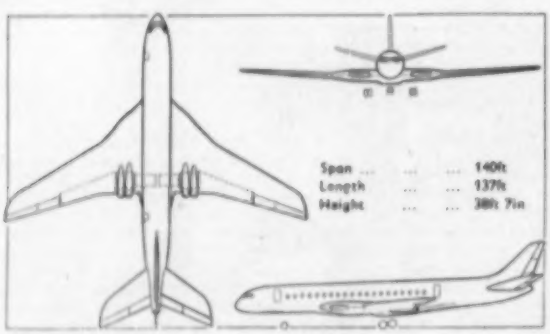
Early in the programme came a contribution from Mr. C. T. Wilkins, de Havilland chief designer. He said that British engines were developing so rapidly that there was a possibility that the Comet 4 with its present fuel capacity would be able to operate the Atlantic non-stop. He added that his company were not considering a transatlantic jet airliner at the moment because he felt that operators required something smaller that could be more widely applied.

Reactions from the United States to British comments on the prospects of the DC-8 and the 707 have been significantly restrained. During the television programme the voice of Mr. Creedy of Pan American World Airways, speaking from New York, was heard. Asked whether the Boeing 707 would be delivered in December 1958, and be in transatlantic service at that time, Mr. Creedy replied in the affirmative, adding that according to PanAm's information the Boeing 707 was a non-stop airliner in both directions.

In reply to a cable from *Flight* a Douglas spokesman stated that they had contracted to deliver overwater DC-8s, with "advanced" engines, to P.A.A. in late 1959 and to K.L.M. in early 1960. While not wishing to enter the lists of controversy Douglas pointed out that they did not have a reputation for committing themselves to delivery dates which could not be fulfilled, or for offering optimistic delivery in order to attract orders. They confidently expected that the DC-8 would be in non-stop transatlantic operation by 1960.

Pratt and Whitney, about whose J57 and J75 doubts have been expressed, can say nothing for reasons of security. It is likely, however, that the "advanced" engine mentioned in the Douglas and Boeing brochures is a development of the high-compression, twin-spool J75 which in its present 15,000 lb thrust form is in production for the Republic F-105, North American F-107, and probably for the tanker version of the Boeing 707 (KC-135). Test flying is under way in a B-45, due to be joined shortly by an eight-engined B-52. The power that developed versions are already giving on the test bed is believed to be very much higher.

In an article in the *Financial Times*, Sir Miles Thomas states that one of the transatlantic projects in which B.O.A.C. is interested is the projected B.E.25-powered "V.L.R." machine, a specification for which is being prepared jointly by Bristol and the Convair and Canadair divisions of the U.S. General Dynamics Corporation. This is referred to on page 794.



MR. N. B. HIGGS

WE hear with regret of the death, in New Zealand on November 12th, of Mr. N. B. Higgs, who until recently had represented the Bristol Aeroplane Co. in the Dominion since 1939. He was 49 years of age.

Mr. Higgs joined the Bristol engine division in 1936 and for three years was a member of the experimental department, working on all types of engines. He transferred to the service department in August 1939 and at the end of that month left the United Kingdom for New Zealand, where he was a service representative until 1946. In that year he was appointed the company's agent in the Dominion, later forming a company in association with his brother, who was formerly with the engine division's technical publications department.

Mr. Higgs remained the company's agent until the formation this year of the Bristol Aeroplane Company (New Zealand), Ltd., although severe illness had for some time prevented him from taking an active part in business affairs.

SERVICE AVIATION

Royal Air Force and Fleet Air Arm News

R.A.F. Senior Appointments

IT has been announced that A. Cdre. R. A. C. Carter is to become S.A.S.O. Transport Command; that G/C. P. H. Hamley has been appointed to command the Metropolitan Sector, Fighter Command, with the acting rank of air commodore; and that G/C. C. Scragg is to become Director of Operational Requirements (B) at Air Ministry, with the acting rank of air commodore. All appointments take effect in December.

A. Cdre. Carter was born in 1910, joined the R.A.F. as an apprentice in 1927 and, three years later, entered Cranwell. During the war he commanded Nos. 150 and 103 Bomber Squadrons and R.A.F. Grimsby, before going to H.Q. Bomber Command. After the war, he took the R.A.F. Staff College course and attended the U.S. Armed Forces Staff College before joining the R.A.F. delegation in Washington. For a year in 1952, he was loaned to the R.N.Z.A.F. and has, since then, commanded R.A.F. Upwood.

G/C. Hamley joined the R.A.F. in 1931 and flew with fighter and bomber squadrons in Britain and India, and was at No. 3 F.T.S. at the outbreak of war. In August 1943 he formed No. 488 Mosquito Squadron and gained considerable experience of night fighter flying. At the end of the war he was in No. 8401 Air Disarmament Wing. After taking the R.A.F. Staff College course at Haifa in 1946, he became S.P.S.O. at H.Q. Air Command, South-East Asia. He was appointed Air Attaché in Rome in October 1950, and has since commanded R.A.F. West Malling.

G/C. Scragg was, until last January, commander of R.A.F. Little Rissington, home of C.F.S. He enlisted as an apprentice in 1926, became a flight-sergeant pilot and was permanently commissioned in 1938. Before 1943 he was an instructor in England and Canada. Afterwards he flew with No. 103 Sqn., commanded No. 166 Sqn. and was shot down and captured in 1944. Since the war he has commanded Transport Command Development Unit, taken courses at the Joint Services Staff College and Imperial Defence College and served at H.Q. Coastal Command, before becoming Deputy Director of Operational Requirements (5), Air Ministry.

Home from South America

THE four Shackleton 2s of No. 228 Squadron, Coastal Command, which have been on a 15,000-mile training and goodwill flight to South America and the West Indies (see *Flight*, October 28th) arrived back at St. Eval, Cornwall, on the afternoon of November 13th. They had visited Guiana, Brazil, Venezuela, Colombia, Jamaica, Florida and Bermuda. In charge was A.V-M. G. W. Tuttle, A.O.C. No. 19 Group, who said on landing, "The other ranks are the best ambassadors Britain could have. They have been just splendid."

Malayan Auxiliaries

THE first Malay to qualify as a pilot in the Malayan Auxiliary Air Force received his wings recently from the Chief Minister of the Federation at a parade in Penang. The new pilot's name in Inche Abdul Aziz.

Australian Jet Trainers

ORDERS have been placed with the de Havilland factory at Bankstown, near Sydney, for a number of Vampire Trainers for the R.A.A.F. This follows a first order for Vampire Trainers placed some years ago. In addition, nine Canberra Trainers have been ordered. Two of them will be flown out from England by R.A.A.F. crews next January, and seven others will be built by the Government Aircraft Factory as part of the current order for 48 Canberras now being built there. Nos. 2 and 6 Sqns. of No. 82 Bomber Wing at Amberley are already completely re-equipped with Canberra bombers.

These orders are reported to have resulted from recommendations of an aircraft commission which visited England and the U.S.A. a year ago.

New Gannet Squadron

FIRST formed in 1933, No. 812 Squadron, Fleet Air Arm, re-formed at the Royal Naval Air Station Eglinton, near Londonderry, on November 7th. Equipped with Fairey Gannet anti-submarine aircraft it will comprise part of a carrier air group, also to include Sea Hawk and Wyvern squadrons, to be embarked in a Fleet carrier. Commanding officer of the re-formed unit will be Lt-Cdr. Geoffrey D. Luff, R.N., who was awarded the D.S.C. for his work as Senior Observer of the Royal Naval Helicopter Squadron operating in Malaya. After service in the Far East and home waters during the late war No. 812 Squadron was one of the air units of H.M.S. *Ark Royal* when she was lost in the Mediterranean. The squadron received new equipment at Gibraltar and embarked for service afloat again within two days.

R.A.A.F. Trophies

THIS year's annual air weapons competition for fighter squadrons of the R.A.A.F. was won by No. 25 (City of Perth) Sqn. of the Citizen Air Force. Marks were given for rocketry, cine-gunnery, air-to-air, and air-to-ground firing and maintenance. Runners-up were respectively Nos. 77 and 75 Sqns.

The Gloucester Cup for the most proficient unit of the R.A.A.F. has been won by No. 1 Bomber Sqn., stationed in Singapore.

R.A.F. Emergency Ration

REPLYING to a question recently, Mr. George Ward, Under-Secretary of State for Air, said that a new emergency ration intended for use by R.A.F. aircrew

Nautically equivalent in almost every way to the amenities and layout of a land base, the flying-boat station nevertheless presents an aspect and an interest entirely peculiar to the world of the "boats." The combination of airmanship and seamanship is also one of the factors which makes every flying-boat crew a very special team. Here the Sunderlands of No. 201 Sqn.—members of which, incidentally, have just won the Aird White Swimming Trophy—lie at moorings in Pembroke Dock, South Wales. "Flight" photograph

SERVICE AVIATION . . .

survivors in extreme heat or cold had been produced by the R.A.F. Institute of Aviation Medicine with the assistance of the catering branch of the Air Ministry and of many private firms. It had successfully passed laboratory and field tests, he said, in extremes of heat and cold, and was now being subjected to prolonged storage trials in Singapore, Aden and Canada. It was hoped that the ration will give aircrew a greater chance of survival than any emergency food pack yet devised. It was already being carried in some types of Royal Air Force aircraft and by R.A.F. mountain rescue teams.

R.C.A.F. Appointment

THE appointment is announced of A. Cdre. S. W. Coleman, C.D., Air Officer Commanding, Tactical Air Command, Edmonton, as Assistant Chief of Staff for Plans and Policy on the staff of AAFCE at Fontainebleau. A. Cdre. Coleman leaves for his new post next month and will replace A. Cdre. Robert C. Ripley, O.B.E., C.D., who will relinquish his present position to attend the Imperial Defence College next January. G/C. H. G. Richards, O.B.E., C.D., Chief Staff Officer, Tactical Air Command, will serve as Acting A.O.C. pending nomination of a replacement for A. Cdre. Coleman.

Ali Osman's Dilemma

FOR over 30 years the dignified figure of Ahmed Mohamed Ali Osman ("Ali Osman" to the R.A.F.) has squatted on the steps of R.A.F. messes in Khartoum selling silver, carved ivory, and alligator, crocodile, gazelle and snake skins. He was the doyen of the local community of Sudanese merchants and servants whose connection with the R.A.F. began, in many cases, in the 1920s. Ali now finds himself in a dilemma, for his R.A.F. friends (among whom he counts many very senior officers whom he first met as newly commissioned pilots with No. 47 Squadron) are leaving the Sudan under the Anglo-Egyptian agreement. Much as he would like to follow them, he feels that perhaps he is getting too old for the change. He has no need, however, to worry financially, for his association with the Service has paid good dividends. Both his sons were educated in England, where one is now a London architect; the other is a doctor practising successfully in Khartoum.

Royal Air Force Appointments

THE following continues recent lists of Royal Air Force appointments as announced by the Air Ministry:—

G/C. J. O. W. Oliver, C.B., D.S.O., D.F.C., to Headquarters, No. 18 Group, for administrative staff duties; G/C. T. W. Piper, C.B.E., A.F.C., to Headquarters, Transport Command, for air staff duties; G/C. A. D. Groom, D.S.O., to Headquarters, No. 63 Group, for administrative staff duties; G/C. C. R. D. L. Lloyd, O.B.E., to Headquarters, Technical Training Command, for administrative staff duties; G/C. R. J. Gosnell, D.S.O., D.F.C., to R.A.F. North Weald, to command; G/C. R. F. Aitken, O.B.E., A.F.C., to H.Q., Middle East Air Force, for administrative staff duties; G/C. C. B. E. Burt-Andrews to H.Q., Far East Air Force, for joint staff duties; G/C. R. K. Cassels, D.F.C., A.F.C., to R.A.F. Little Rissington to command; G/C. R. B. Harrison to Air Ministry for duty in the Department of the Air Member for Supply and Organization; G/C. G. Lowe, D.F.C., A.F.C., to R.A.F. Amman, Jordan, to command; G/C. B. Robinson, C.B.E., to Air Ministry for duty in the Department of the Air Member for Supply and Organization; G/C. J. N. Tomes, C.B.E., to Air Ministry for duty in the Department of the Chief of the Air Staff; G/C. E. E. Vielle, O.B.E., to Air Ministry for duty in the Department of the Chief of the Air Staff; G/C. E. A. Whiteley, C.B.E., A.F.C., to R.A.F. Tangmere, to command; G/C. J. A. Kent, D.F.C., A.F.C., to Headquarters, No. 12 Group, for administrative staff duties; G/C. H. B. Collins to Headquarters, Fighter Command, for technical staff duties; G/C. A. P. Chamberlain to Headquarters, No. 83 Group, for technical staff duties; G/C. K. A. Jackman to Headquarters, Home Command, for administrative staff duties; G/C. D. N. Kington-Blair-Oliphant, O.B.E., to R.A.F. Locking to command; G/C. R. J. Abrahams, O.B.E., to R.A.F. Hullavington to command; G/C. G. V. Fryer, O.B.E., A.F.C., to R.A.F. West Malling to command; G/C. J. D. Rutherford to Headquarters, Flying Training Command, for technical staff duties; G/C. M. F. D. Williams, C.B.E., D.S.O., to R.A.F. Akrotiri, Cyprus, to command; G/C. F. W. Wiseman-Clarke, M.B.E., to Headquarters, Bomber Command, for administrative staff duties.

W/C. B. R. Macnamara, D.S.O., to Headquarters, Transport Command, for air staff duties (with acting rank of Group Captain); W/C. N. B. Harvey, D.S.O., to R.A.F. West Raynham, to command; W/C. F. M. Osborn, O.B.E., D.F.C., A.F.C., to R.A.F. Lyneham, for flying duties; W/C. D. A. Southall, D.S.O., D.F.C., A.F.C., to Air Ministry for duty in the Department of the Chief of the Air Staff; W/C. R. C. Crosbie to R.A.F. Sylt, for technical duties; W/C. C. F. Price to Headquarters, Middle East Air Force, for air staff duties; W/C. H. J. Walker to Ministry of Supply; W/C. F. P. Woodcraft to Air Ministry, for duty in the Department of the Air Member for Supply and Organization; W/C. A. James, O.B.E., to Headquarters, Home Command, for administrative staff duties; W/C. R. M. Coad, A.F.C., to R.A.F. Cosford, for administrative duties; W/C. W. J. Winter, D.F.C., to R.A.F. Record Office, for administrative duties; W/C. R. W. Pye to R.A.F. Hornchurch as Aircrew Selection Board President; W/C. J. C. Coombes to Air Ministry for duty in the Department of the Chief of Air Staff; W/C. W. G. Craddock to Ministry of Supply; W/C. J. J. Dennis, O.B.E., to Headquarters, British Forces, Aden, for air staff duties; W/C. M. Meehan to No. 3 Wing, Aden Protectorate Levies, to command; W/C. J. McP. Adams to No. 1 Radio School for technical duties; W/C. A. G. Clennett, M.B.E., to R.A.F. Dishforth for technical duties; W/C. E. G. Moore, O.B.E., to R.A.F. Harpur Hill to command; W/C. F. G. Foot, O.B.E., to Headquarters, 2nd Tactical Air Force for air staff duties (acting rank of group captain); W/C. C. W. S. Jones to Air Ministry for duty in the Department of the Air Member for Personnel (acting rank of group captain); W/C. H. Bamforth, M.B.E., to R.A.F. Titchfield to command; W/C. A. H. Hole to R.A.F. Wilmslow for administrative duties; W/C. J. R. Brown to Air Ministry for duty in the Department of the Air Member for Supply and Organization; W/C. W. C. Clements to R.A.F. Melksham for technical duties; W/C. G. P. Marvin, C.B.E., to Headquarters, Maintenance Command, for administrative staff duties; W/C. W. P. Whitworth, A.F.C., to R.A.F. West Freugh to command.

S/L. S. Findlay, M.B.E., to R.A.F. Yatesbury for administrative duties (with acting rank of wing commander); S/L. L. A. Malins, D.S.O., D.F.C., to Air Ministry for duty in the Department of the Chief of the Air Staff (with acting rank of wing commander); S/L. J. E. Potter to R.A.F. Leconfield for technical duties (with acting rank of wing commander); S/L. E. D. Smith to Headquarters, No. 90 Group, for technical staff duties (with acting rank of wing commander); S/O. B. G. Martin, W.R.A.F., to Headquarters, Fighter Command, for administrative staff duties (with acting rank of wing officer); S/O. F. R. Pentland, W.R.A.F., to Headquarters, Bomber Command, for administrative staff duties (with acting rank of wing officer); S/L. J. Welch, D.F.C., to Air Ministry for duty in the Department of the Chief of the Air Staff (with acting rank of wing commander); S/L. I. S. Stockwell, D.F.C., A.F.C., to Air Ministry for duty in the Department of the Chief of the Air Staff (acting rank of wing commander).

Reunion

THE Old Comrades Association of R.A.F. Stations Hurn, Harwell and Rivenhall (38 Group) and the Airborne Forces Old Comrades Association announce the 10th annual reunion dinner, to be held at the Victoria Hotel, Buckingham Palace Road, Victoria, London, S.W.1, on March 3rd, 1956, at 6.30 for 7 o'clock sharp. Tickets, £1 each, are obtainable from the honorary assistant secretary, Mrs. L. G. Rendall, Grosvenor Hotel, Victoria, London, S.W.1.

At lower left, officers of Toronto aircrew are presented to H.R.H. the Duke of Edinburgh in the wardroom of H.M.S. "Daedalus" (R.N.A.S. Lee-on-Solent) before dining on the anniversary of Toronto, November 11th. The Duke is shaking hands with Cdr. N. J. Scorlett-Streatfield, D.S.C., R.N. The second picture shows the illuminated Swordfish in front of the wardroom.

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FOR further particulars and application forms write (preferably by postcard) to Secretary, Civil Service Commission, Burlington Gardens, London, W.1, quoting No. 1001/56. Completed application forms to be returned by 22nd December, 1955. [4516

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PUBLIC ANNOUNCEMENTS

AIR TRANSPORT ADVISORY COUNCIL

THE Air Transport Advisory Council give notice that they have received the undermentioned applications to operate scheduled air services:

FROM Air Charter, Ltd., of 15, Great Cumberland Place, London, W.1, for the following amendments to their Vehicle Ferry Services which the Company have been approved to operate until June, 1961:

APPLICATION No. 288/2. For permission to carry passengers not associated with vehicles without restriction on the service between Southend and Calais.

APPLICATION No. 474/1. For similar permission on the service between Southend and Ostend.

FROM Eagle Aviation, Ltd., of 29, Clarges Street, London, W.1, for the following Seasonal Inclusive Tour Services to be operated with Viking aircraft in conjunction with All Europe tours for the carriage of passengers and supplementary freight at an initial frequency of one return flight weekly during the season from May to October inclusive each year for a period of seven years commencing 1st May, 1956:

APPLICATION No. 682. For a service between London (Blackbushe) and Hamburg, to be operated on Thursdays.

APPLICATION No. 683. For a service between London (Blackbushe) and Zurich (Kloten), to be operated on Fridays.

FROM B.K.S. Air Transport, Ltd., of 1, Marylebone High Street, London, W.1:

FOR the following Normal Scheduled Services to be operated with Dakota and Viking aircraft for the carriage of passengers, supplementary freight and mail at a frequency of from two to seven return flights weekly for a period of 10 years, commencing three months after the date of final approval:

APPLICATION No. 684. For a service between Southend and Brussels.

APPLICATION No. 685. For a service between Southend and Dusseldorf, with permission to integrate this service initially with the Normal Scheduled Service which the Company have been approved to operate from Leeds (Yeadon) to Dusseldorf via Southend (technical stop), and with the Internal Service which they have been approved to operate between Leeds (Yeadon) and Southend.

APPLICATION No. 558/1. For an amendment to the Seasonal Inclusive Tour Service which the Company have been conditionally approved to operate in conjunction with Sky Tourist Services, Ltd., from Southend to Rome and/or Palmero via Nice (technical stop) and from Southend to Naples via Nice (technical stop), so as to operate this service during the period from 1st October, 1956 to 31st March, 1957, inclusive instead of from 1st May, 1956 to 31st October, 1956, inclusive as approved.

FROM Don Everall Aviation, Ltd., of Elmdon Airport, Birmingham:

APPLICATION No. 9/5. For an amendment to the terms of the U.K. Internal Service which the Company have been approved to operate until 1959 between Leicester East and/or Coventry and Jersey and/or Guernsey via Bournemouth (technical stop), so as to operate at an increased frequency of eight return flights weekly on Fridays and Saturdays from mid-June to mid-September during the period of approval.

APPLICATION No. 454/1. For an amendment to the Seasonal U.K. Internal Service which the Company have been approved to operate on the route Birmingham—Leicester East (optional)—Coventry (optional)—Isle of Wight (Bembridge) during the season from April to October inclusive each year until 1961, so as to operate at an increased frequency of up to eight return flights daily. Also for permission to include Wolverhampton as an additional optional traffic stop, and to operate the service throughout the year.

APPLICATION No. 125/3. From Central African Airways Corporation of P.O. Box 1979, Salisbury, Southern Rhodesia, for an amendment to the terms of approval of their Colonial Coach Service which the Corporation have been authorized to operate between Salisbury (Southern Rhodesia) and London until 31st March, 1956, so as to extend the period of operation from 1st April, 1956, to 31st March, 1957, at the latest frequency authorized, i.e. eight return flights per 28 days from April to October inclusive and six return flights per 28 days from November to March inclusive.

THESE applications will be considered by the Council under the Terms of Reference issued to them by the Minister of Civil Aviation on 30th July, 1952. Any representations or objections with regard to these applications must be made in writing stating the reasons and must reach the Council within 14 days of the date of this advertisement, addressed to the Secretary, Air Transport Advisory Council, 3, Dean's Yard, London, S.W.1, from whom further details of the applications may be obtained.

WHEN an objection is made to an application by another air transport company on the grounds that they are applying to operate the route or part of route in question, their application, if not already submitted to the Council, should reach them within the period allowed for the making of representations or objections. [4524

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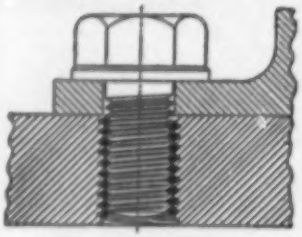

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An interesting opportunity occurs for a Technical Assistant in the Analogue Computing Section. Applicants must possess H.N.C. (Elect.) or equivalent with basic knowledge of electronics and be interested in the solution of problems associated with aircraft engineering.

This post is permanent in N.W. London area and carries generous salary with attractive working conditions.

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Consideration will also be given to Draughtsmen with Mechanical, Structural or Electrical Experience.

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The engagement of persons answering these advertisements must be made through the local office of the Ministry of Labour and National Service, etc., if the applicant is a man aged 18-64 or a woman aged 18-59 inclusive, unless he or she or the employer is excepted from the provisions of The Notification of Vacancies Order 1952.

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2 SENIOR ENGINEERS for senior post in the Engineering Department of U.B.A. Applicants must have extensive previous experience and hold A.M.E. Licences categories "A" and "B" covering Dakota aircraft.
Salary: Kyats 2,250 + £40 per month.

APPLICATIONS should be forwarded to reach the following address not later than first post on Friday, December 2nd, 1955:—
The Manager (Engineering) U.B.A.,
c/o Embassy of the Union of Burma,
19a Charles Street,
Grosvenor Square,
London, W.1.

A SENIOR representative of U.B.A. will be available to interview applicants who are able to attend at the above address (at their own expense) between 10 a.m. and 1 p.m. on Friday, December 2nd, 1955. [4527

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ALL positions are pensionable, and commencing salaries will be based on qualifications and experience. Five-day week.

PLEASE write fully to:
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MECHANICAL ENGINEER (SENIOR)

required for design and development work on novel aircraft components with special emphasis on hydraulic equipment. Essential qualifications: technical education to Degree standard; wide experience in high grade precision engineering, preferably but not necessarily including hydraulic equipment; initiative; ability to lead in team. Appropriate salary. Good conditions. Pension scheme. Apply with full details of experience and indication of salary requirements to:
Personnel Manager,
SPERRY GYROSCOPE CO., LTD.,
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Brentford,
Middx. [4449

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PENSION scheme. Apply in writing to Chief Executive, Aircraft Research Association Ltd., Manton Lane, Bedford [4506

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An excellent opportunity occurs with an Aviation concern in America for a

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having substantial experience and demonstrated ability in the field of

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Candidates are required to hold a good engineering degree and must be able to show several years of development experience in this field including a practical background. They will be applying for a Staff position in the engineering group of a relatively small company which is however part of a large aeronautical organization. The company has extensive engineering assignments in both Civil and Military Aviation, most of the latter concerning aircraft of prime national importance.

The man able to offer first-class experience and ability will in turn be offered a substantial salary with good opportunities for advancement. He will work in pleasant conditions in a modern air-conditioned factory and will be able to establish for himself and his family a very agreeable life on an attractive part of the Atlantic coast near New York, which is well equipped with schools, housing, shopping centers, and also offers exceptional recreational facilities.

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This information in the first instance should be forwarded to:

Box No. 7695, c/o Flight.

SITUATIONS VACANT

TECHNICAL ASSISTANT

required for development work on new materials and processes. Applicants must have had a good engineering background with some ability in the preparation of working drawings and preferably had some experience in the aircraft industry. This post will provide adequate scope for a keen man with initiative.

Written applications (in complete confidence) giving concise details of age, qualifications and experience, in the first instance to:

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BLACKBURN & GENERAL AIRCRAFT, LTD.,
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Mark envelopes: "Development." [4416

A. V. ROE & CO., LTD.

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WOODFORD, CHESHIRE

VACANCIES exist in the Airframe Design Department for Flutter Technicians.

APPLICANTS should possess a degree in engineering or mathematics or hold an equivalent qualification with a good mathematical background. Aircraft or missile experience is desirable but not essential.

APPLY: The Chief Engineer, A. V. Roe & Co., Ltd., Weapons Research Division, Woodford, Cheshire. [4477

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These posts will be at a new factory which the Company is establishing in Southampton, but the successful candidates will be required to undergo a period of about one year's training at the company's Mitcham plant.

The commencing salaries paid will be dependent on age and experience, and these posts offer an excellent opportunity to suitable men to enter the field of semi-conductor engineering on the manufacturing side. Please apply in writing to

The Personnel Officer,
THE MULLARD RADIO VALVE CO., LTD.,
New Road,
Mitcham Junction, Surrey,
quoting reference GBK/S4.

PROJECT DESIGN DRAUGHTSMEN

An expanding aircraft company in London has vacancies for a number of Project Design Draughtsmen. Applicants, who must have had several years' experience in an Aircraft Design Office of repute, are required for original design work on projects of an advanced nature. The positions offer excellent prospects of advancement to suitably qualified men, with commencing salaries between £800 and £1,000 p.a.

Box AC 13880, Samson Clarks, 57-61 Mortimer St., W.1.

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at their new factory in the town of East Kilbride, which is approximately 8 miles from Glasgow. This is a new project which will provide unlimited opportunities in the future and there are immediate vacancies for the following positions:—

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DESIGN DRAUGHTSMEN. Applicants should have minimum technical qualifications of H.N.C. and have experience of engine or accessory design.

DETAIL DRAUGHTSMEN. Applicants preferably with H.N.C. and previous experience on Aero engine or accessory work.

HOUSING ACCOMMODATION will be supplied after a probationary period of three months.

Applications, marked TE/20, giving full particulars of previous experience, qualifications, and salary required, to the

PERSONNEL MANAGER,
ROLLS-ROYCE, LTD., HILLINGTON, GLASGOW, S.W.2

after which arrangements will be made to interview suitable applicants in their own area.

SITUATIONS VACANT

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A VERSATILE light mechanical Design Engineer capable of working with the minimum of supervision is required for original and interesting work. DESIGN Draughtsmen.

VACANCIES also exist on the above work for one junior and one senior Design Draughtsman with aircraft or instrument experience.

APPLICATIONS should be addressed to Chief Engineer, Pye Limited, St. Andrew's Road, Cambridge. [4523

AERO ENGINES. A company manufacturing gas turbine engines has the following vacancies for Mechanical Engineers.

FOUR positions in the Main Engine Development Department. Applicants must have a Degree or H.N.C. Salary range £600-£800 dependent on qualifications and experience. Two positions in the Defect Investigations Department. Salary range £750-£900 dependent on experience.

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BRITISH PETROLEUM COMPANY LIMITED requires two Engineers for its Aviation Branch based in London. Applicants should have completed a full Mechanical Engineering apprenticeship, be in possession of the Higher National Certificate, and have general practical engineering experience. Work will be interesting and varied covering all aspects of fuel servicing of aircraft throughout the world and will entail periodic visits abroad. Good opportunities for promotion. Non-contributory Pension Scheme. Luncheon club. Salary according to age, qualifications and previous experience. Write, giving full details, quoting H.3539 to Box 8295, c/o 191, Gresham House, E.C.2. [4507

A WELL-KNOWN aircraft company is able to offer attractive positions to Draughtsmen (all grades) in their London Design Office.

APPLICATIONS will be welcomed from:—

(i) Draughtsmen with experience of the design of aircraft structures, systems, etc.

(ii) Draughtsmen who wish to transfer to this type of work.

AMONG the advantages which can be offered are:—

(a) Good salaries.

(b) Increases according to individual merit.

(c) Excellent working conditions in pleasant surroundings.

(d) Interesting work with a friendly team.

ALL relevant details, e.g., age, experience, salary, should be forwarded to Dept. LD/7, Box 5J C 2463, A.K. Advg., 212a, Shaftesbury Avenue, London, W.C.2. [4490

SAUNDERS-ROE LIMITED have vacancies for Junior Technicians in their Design Organization at Osborne, I.o.W.

APPLICANTS should have completed their National Service and be of Higher National Certificate standard.

EXPERIENCE of aircraft design would be an advantage. Assistance with housing accommodation may be offered. Good conditions, pension scheme, etc.

SEND details of age, experience, etc., and present salary to the Personnel Officer, Saunders-Roe Limited, East Cowes, I.o.W. (Please quote ref. P/55.) [4492

APPLICATIONS are invited from Senior Electrical Draughtsmen of H.N.C. (electrical) standard who would like to be considered for a position now available at Saunders-Roe, Ltd., Osborne, I.o.W.

SUITABLE experience in the aircraft industry would be an advantage. Assistance with housing accommodation is available.

DETAILS, including age, salary and experience, and quoting ref. P/56 should be forwarded to the Personnel Officer, Saunders-Roe, Ltd., East Cowes, I.o.W. [4525

AIRCRAFT Stressmen of all grades required for interesting project work with an expanding company on the South Coast. Apply in writing to F. G. Miles Limited, Shoreham Airport, Sussex. [4515

PILOT wanted, experienced, endorsed Dove, Rapide. Sen. Comm. Lic. with instrument rating. Good pay and allowances. North-west England. Box No. 7647. [4496

INSPECTOR (Chief) required for approved A.I.D. organisation, preferably with specialised knowledge of aircraft radio connectors and similar assemblies. N.W. district.—Box 7741. [4514

BRITISH OVERSEAS AIRWAYS CORPORATION invite applications for the position of Senior Engineering Instructor with their Central Training Unit at London Airport.

The successful applicant will be responsible to Training Manager for the organisation of engineering training to Corporation standards.

Candidates will be expected to possess the following qualifications:

(i) Considerable aircraft engineering experience, including particularly experience in the field of aircraft maintenance and operation.

(ii) Supervisory and administrative experience and ability.

(iii) Instructional experience.

(iv) An engineering degree or diploma in aeronautical engineering or equivalent professional engineering qualifications.

The salary for this appointment will be in the Scale £1,140-£1,445 p.a. according to qualifications and experience. There is a contributory pension scheme.

Applications stating age, past and present posts held, qualifications and experience, should be sent to Chief Personnel Officer, B.O.A.C., Headquarters Building, London Airport, Hounslow, Middx.

The closing date for the receipt of applications will be 2nd December, 1955. [4510

AERODYNAMICISTS capable of taking a position of leading responsibility in the High Speed Section of the Design Department at Osborne are invited to write without delay to the address below.

THE selected applicant will work on a progressive programme of supersonic designs, interesting special projects and associated physics and engineering problems. He will have technical qualifications to Higher Degree standard and adequate applied experience.

AN attractive salary, good prospects, assistance with housing and participation in assurance and pension schemes are among the advantages which can be offered.

APPLICATIONS (quoting ref. F/54) should be addressed to the Personnel Officer, Saunders-Roe Limited, East Cowes, I.o.W. [4494

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METAL detail fitters for sub-assembly, also Coach Joiners for interior woodwork, urgently required on Rolls-Royce and Bentley coachwork.—James Young Ltd., London Road, Bromley, Kent. Ravensbourne 3434. [4509

EXPERIENCED Radio Engineer required preferably one who has held inspection stamp with approved organisation overhauling aircraft radio equipment. Apply: Chief Engineer, Eagle Aircraft Services, Ltd., Blackbushe Airport, Camberley, Surrey. [4519

FLIGHT Engineers required for Viking, York and Viscount aircraft. Minimum qualifications "A" and "C" licences on at least one of the above types. Good pay and conditions. Write Field Aircraft Services Ltd., London Airport. [4387

THE PARSONS AND MARINE ENGINEERING TURBINE RESEARCH AND DEVELOPMENT ASSOCIATION are engaged on an extensive programme of aerodynamic research on fluid flow in steam and gas turbines and have built a special experimental turbine for this purpose.

AN Aerodynamicist of degree standard is needed to look after the project. Previous experience of aerodynamics either at college or in industry is essential. Candidates should preferably be under 30 years of age. The starting salary, which is subject to annual review, depends on age and qualifications but compares favourably with what a first-class man can command in other branches of industry or science. The post also carries other substantial benefits including superannuation.

APPLICATIONS in writing, stating age and experience, should be addressed to the Research Director, Parnetrada Research Station, Wallsend, Northumberland. [4517

AIRWORK LIMITED have aircrew vacancies for Flight Engineers. North Atlantic experience desirable but not essential. Salary scale £880 to £1,240 p.a. Full conditions of employment, allowances, pension scheme, etc., will be given to applicants who address themselves in writing giving details of past experience to Operations Superintendent, Airwork Limited, Air Transport Division, Building Number 11, London Airport. [4520

THE ENGLISH ELECTRIC COMPANY LIMITED

AIRCRAFT DIVISION

PROJECT DESIGNERS AND ENGINEERS

Keen young men with experience of aircraft design or engineering are required to work on a number of interesting projects where they can apply their ideas and experience at the preliminary design stage to problems in:

Design and Weight Analysis of Optimum Structures
Design and Installation of Aircraft Systems and Equipment
Modern Forms of Propulsion
Aerodynamics of High Speed Aircraft
Boundary Layer Control Applications
Use of Guided Weapons and Radar Equipments
Operational Performance

For these vacancies, designers should have H.N.C. or better and a minimum of five years' experience in aircraft design. Engineers should have a degree or equivalent, and experience in one or more of the above subjects.

The Company's experience in designing and building modern aircraft ensures that the work undertaken in the Project Section will be of a sufficiently advanced nature to interest young Designers and Engineers of the right calibre.

The Aircraft Division is situated near a pleasant residential part of the Lancashire coast and assistance in removal expenses will be given in certain cases. Interviews can be arranged in London if desired. Apply in first instance, giving full details of education and experience to:—

THE ASSISTANT CHIEF ENGINEER (NEW DESIGN), WARTON AERODROME, NR. PRESTON, LANCS

MARSHALL

AIRPORT WORKS CAMBRIDGE

DESIGN AND DRAWING OFFICE

Modification, Trial Installation, and Development Work

including radar and electronic installations on

MULTI-JET & TURBO-PROP AIRCRAFT

SENIOR DRAUGHTSMEN

INTERMEDIATE DRAUGHTSMEN

STRESSMEN

WEIGHTS ENGINEER

TECHNICAL AUTHORS (Electrical)

TECHNICAL AUTHORS (Radar and Radio)

MODERN OFFICES AND EQUIPMENT

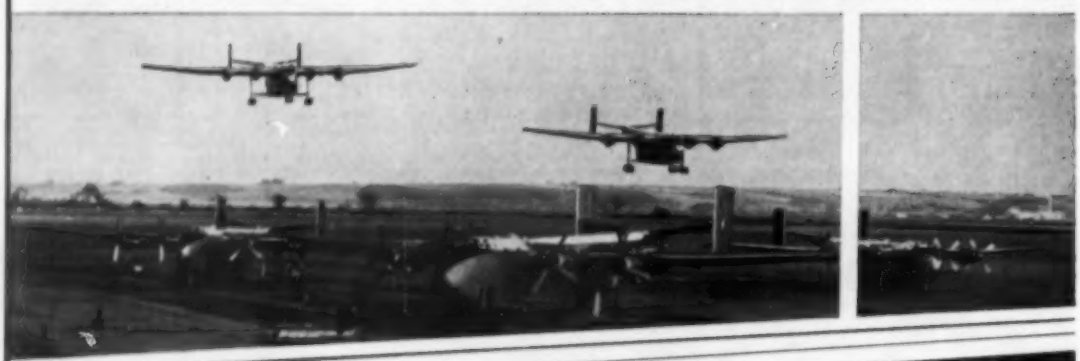
ASSISTANCE GIVEN WITH HOUSING

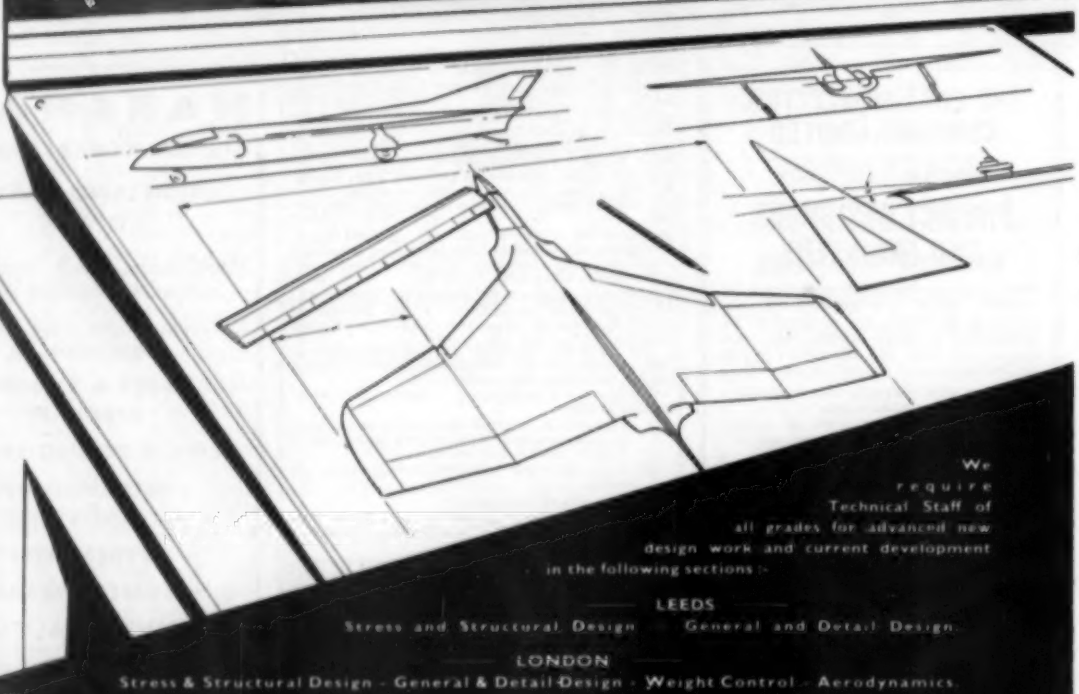
EXCELLENT SALARIES AND PROSPECTS

Applications, with full details, including dates available for interview to:—

PERSONNEL MANAGER

For Today's Production and Tomorrow's Design!





We require Technical Staff of all grades for advanced new design work and current development in the following sections :-

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Stress and Structural Design - General and Detail Design.

LONDON

Stress & Structural Design - General & Detail Design - Weight Control - Aerodynamics.

BROUGH

Stress and Structural Design - General and Detail Design - Weight Control - Technical Publications - Aerodynamics - Wind Tunnel Design and Operation - Structural and Mechanical Test - Electronics - Flight Test Development.

The posts available at various levels will provide interesting work and adequate scope for applicants with initiative and the ability to apply their knowledge and experience.

Lack of specialised experience need not deter you from getting in touch with us to discuss the possibility of suitable openings.

Please write, giving concise details, to The DESIGN SUPERINTENDENT,

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AIRCRAFT DIVISION

Due to the further expansion of the Division, there are vacancies in the Departments shown below for Designers and Engineers interested in working on problems associated with high speed aircraft.

AERODYNAMICS

Aerodynamicists are required to work on a variety of problems including elasticity, gust studies and auto-control analysis. The Aerodynamics Department has a six degree of freedom analogue computor to assist in this and similar work, and also makes extensive use of high speed digital computors.

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Qualified mechanical engineers are required for work on a wide range of interesting and challenging problems arising from the ever increasing complexity and severity of the demands of aircraft operating at high supersonic speeds. The work involves the application of all branches of basic mechanical engineering knowledge to the solution of problems resulting from kinetic heating, etc., and to the practical design of fuel, air, refrigeration and other systems for high speed aircraft.

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Design Engineers and Draughtsmen are required for all classes of work at both Warton and the London D.O. at Acton. The Division's experience in high speed aircraft is unique and applicants are assured of interesting work with one of the most progressive design teams in the country.

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STRESS

Senior Stress Engineers and Stress Engineers are required for work on the structural analysis of modern high speed aircraft. There are also vacancies for engineers who are interested in the application of new stressing methods (involving the use of digital computors) and for work on thermal stress analysis. Vacancies exist for these posts at Warton and London.

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Trained engineers are required for this department which has been engaged in transonic research since 1950. The Division was the first industrial concern in this country to have its own transonic tunnel, and the present facilities of the Department include two supersonic tunnels, a low speed tunnel and a water tunnel. Applicants should have a degree in Engineering or Physics, or H.N.C. and previous experience of Wind Tunnel work is desirable, but not essential.

All these posts are permanent and pensionable and assistance in removal expenses to Warton (near Lytham St. Annes) will be given in certain cases. Applicants can be interviewed in London if desired.

Apply, in writing, to Dept. C.P.S., 336/7, Strand, W.C.2, quoting Ref. No. S.A.27M.

SITUATIONS VACANT

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AIRCRAFT Jig and Tool Draughtsman. Senior and intermediate men with experience of structures are required in the Isle of Wight. Unfurnished accommodation will be offered to selected applicants, and a Staff Assurance Scheme and Pension Fund is in operation. Write, giving details of age, experience and salary expected to the Personnel Officer, Saunders-Roe Limited, East Cowes, Isle of Wight. [4475

PLANNING Engineers required in the Isle of Wight. Senior and intermediate men preferably with experience of aircraft structures. Staff Assurance scheme and pension fund. Unfurnished accommodation will be offered to selected applicants. Write, giving details of age, experience and salary expected to the Personnel Officer, Saunders-Roe Limited, East Cowes, Isle of Wight. [4476

FOLLAND AIRCRAFT LIMITED, Hamble, require an experienced Service Manager to build up and manage their Service Department for the "Gnat" light fighter. Good personality, an engineering background and recent practical experience in the administration and servicing of aircraft are essential qualifications. Write giving age and full particulars to Managing Director, Folland Aircraft Limited, Southampton. [4503

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STRESSMEN required for interesting programme of project and development work. Previous experience preferable but not essential. H.N.C. minimum qualification. Salary in accordance with experience and qualifications. Excellent working conditions. Superannuation scheme. House purchase assistance considered. Within easy reach of Bournemouth. Special transport facilities. Full particulars in writing to Personnel Manager, Flight Refuelling Limited, Tarrant Rushton Airfield, Nr. Blandford, Dorset. [4482

ARMSTRONG SIDDELEY MOTORS have vacancies for both senior and junior engineers for investigation of vibration problems on gas turbine development engines. Degree or H.N.C. in Mechanical Engineering or Electrical Engineering are essential. Electrical Engineers should have some mechanical engineering experience. Applicants must be capable of using necessary recording equipment. Salaries commensurate with qualifications and experience together with good pension scheme. Applications to Reference CG/VP, Technical Personnel Officer, Armstrong Siddeley Motors, Coventry. [4443

BRITISH EUROPEAN AIRWAYS require an Assistant Development Engineer, Radio, in their Project and Development Branch at London Airport. Qualifications: (1) City and Guilds Final Certificate in telecommunications (radio) or equivalent (Graduate of British Institute of Radio Engineers or similar). (2) Age approximately 25. Experience in aeronautical radio field desirable but not essential if balanced by measurement or development experience. Salary £742 10s. 0d.—£867 10s. 0d. or £807 10s. 0d.—£965 0s. 0d. p.a. according to qualifications and experience. Pension scheme, sick pay, air travel concessions, 3 weeks' annual holiday. Written applications, giving full particulars, to Senior Personnel Officer, Engineering, B.E.A., Engineering Base, London Airport, Hounslow, Middlesex. [4513

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AERODYNAMICISTS
MECHANICAL TEST ENGINEERS
and
FLIGHT TEST ENGINEERS
and applications from Engineers in these groups should also be directed to above address.

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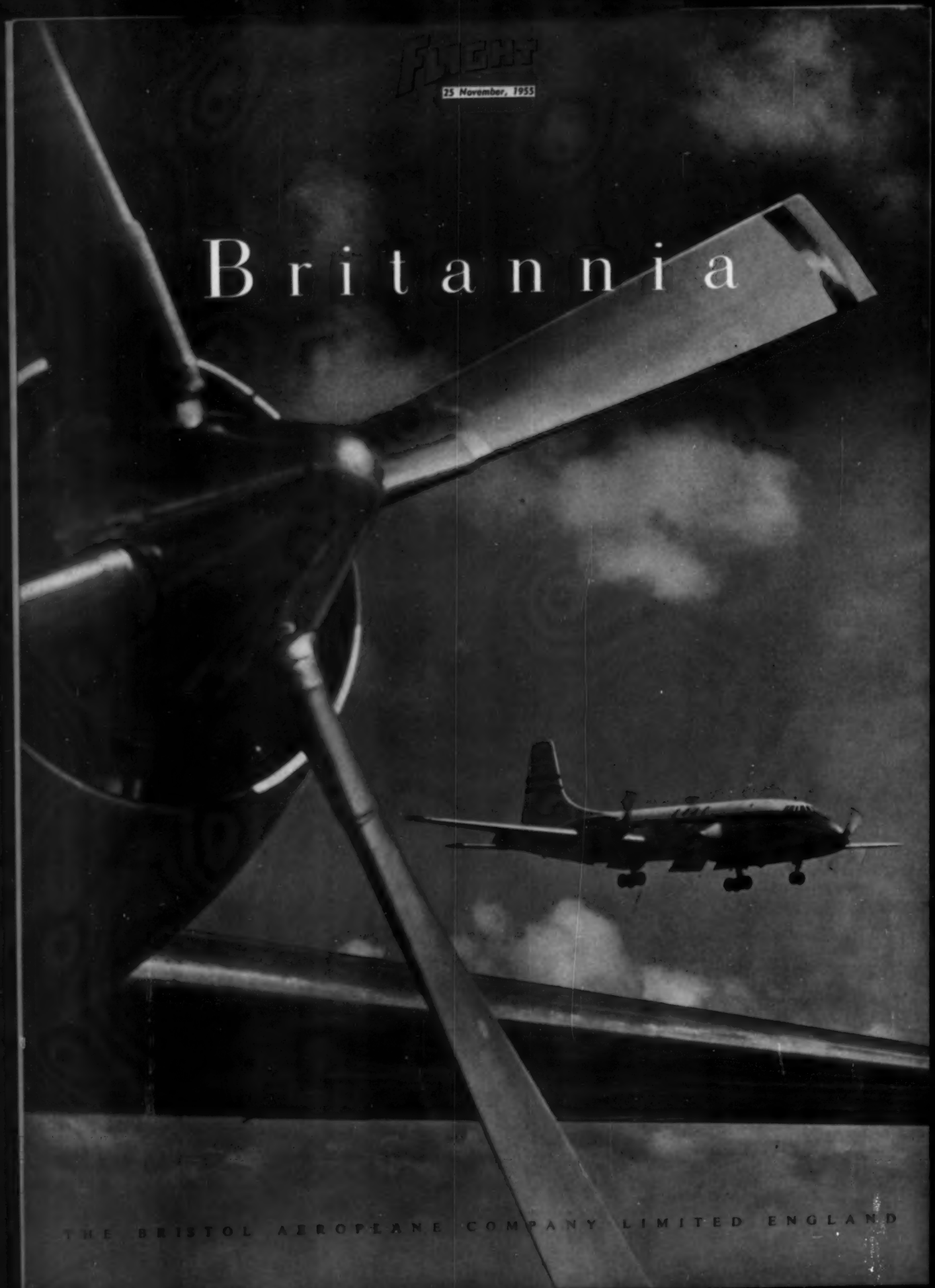
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